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NATIONAL MARINE FISHERIES SERVICE
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November 4, 2014

MEMORANDUM FOR: F/PR - Donna Wieting

FROM: F/NWC3 – Richard W. Zabel

SUBJECT: Estimation of Percentages for Listed Pacific Salmon and Steelhead Smolts Arriving at Various Locations in the Columbia River Basin in 2014

Each year your office requests a description of how the Fish Ecology Division calculates the percentages of listed wild and hatchery fish arriving at selected Columbia and Snake River projects. These estimates are necessary for evaluating the potential impacts of proposed research on listed species. Given new hatchery release estimates, we have computed percentages for 2014. The attached tables show our best estimates for the total numbers of protected juvenile Pacific salmon and steelhead arriving at Columbia River and Snake River dams during the 2014 outmigration, and the percentage of the total collection they will comprise at each dam. We have developed estimates based on transportation with spill river conditions that have existed in the past and on a full transportation scenario (with no spill). Tables 1-6 show the development of the estimates, Tables 7-10 summarize the estimates for each listed species at each project, and Table 11 presents our estimates of the total run size for each listed group of fish.

Several Snake River species will have unmarked hatchery fish released for the 2014 outmigration. Because we have encountered unmarked hatchery spring/summer Chinook salmon in the past, we have adopted a practice of labeling any unclipped spring/summer Chinook salmon that is greater than 124-mm in fork length as hatchery-origin fish. To derive this fork length, we analyzed data from wild spring/summer Chinook salmon PIT-tagged in their natal streams (from our wild parr marking project; Permit #1406,

Study 1) that were subsequently captured and re-measured at one of the lower Snake River dams during slide-gate evaluations (1989-1994 and 1999-2004).

For several groups of fish, we could find no new information; therefore, our estimates for these groups are the same as last year.

Please discuss and distribute this memorandum with all interested parties.

Attachments

cc: F/NWC1 - Ford
F/NWC2 - Dickhoff
F/NWC3 - Dey
F/NWC3 - Downing
F/NWC3 - Fresh
F/NWC3 - Roni
F/NWC3 - Sanderson
F/WCR1 - Turner
F/WCR2 - Rule
F/WCR3 - Bellerud
F/WCR3 - Graves
F/WCR3 - Griffin
F/WCR3 - Kratz
F/WCR3 - Tehan

YEARLING CHINOOK SALMON ESTIMATES

Snake River ESU

The estimate of wild spring/summer Chinook salmon arriving at Lower Granite Dam is based on Idaho Department of Fish and Game and Oregon Department of Fish and Wildlife redd counts for brood year 2012. Redd counts were grouped by drainages where fecundity rates were available: (Middle Fork of the Salmon River, South Fork of the Salmon River, Salmon River (excluding Middle and South Forks), Clearwater River, Imnaha River, and Grande Ronde River). The egg-to-smolt survival rate (to Lower Granite Dam) was set at 5%. We estimate that 1,367,581 wild/natural spring/summer Chinook salmon will reach Lower Granite Dam in 2014.

Under the 2005 listing guidelines, hatchery fish must now be tracked, not only by their listing status, but also by whether they have been adipose-fin clipped. We estimate that 15,762,755 hatchery spring/summer Chinook salmon smolts will be released from Idaho (14,616,514) and Oregon (1,146,241). Of these 15,762,755 hatchery spring/summer Chinook salmon smolts, 5,289,861 will be listed (4,469,709 with AD-clips and 820,152 without AD-clips) and 10,472,894 will be unlisted (8,921,649 with AD-clips and 1,551,245 without AD-clips).

In order to estimate how many hatchery smolts will reach Lower Granite Dam, we first estimated the percentage composition of Snake River spring/summer Chinook salmon arriving at the dam from listed hatcheries (Table 1). Using the mean survival estimates for the 2000-2013 outmigrations (excluding 2001, which was a record low flow year), we estimated the total number of hatchery fish that will arrive at Lower Granite Dam. The mean survival estimate for each hatchery from these years was applied to the 2014 projected release numbers for each hatchery. We estimate that 10,171,808 or 64.53065% of the 15,762,755 hatchery fish released will arrive at Lower Granite Dam. Of these 10,171,808 hatchery spring/summer Chinook salmon smolts, 2,763,044 will be listed (2,337,594 with AD-clips and 425,450 without AD-clips) and 7,408,764 will be unlisted (6,421,711 with AD-clips and 987,053 without AD-clips).

In June 2005, Snake River hatchery fall Chinook salmon were listed under the ESA. While most hatchery fall Chinook salmon are released as subyearlings, the Nez Perce Tribe and Washington Department of Fish and Wildlife release yearling fall Chinook salmon above Lower Granite Dam. Because these fish may not be distinguishable from yearling spring/summer Chinook salmon, they have been included in the yearling estimates detailed below.

Holdover fall Chinook salmon (wild fish that do not outmigrate as subyearlings and hatchery fish released as subyearlings that did not outmigrate as subyearlings) show extreme year-to-year variability in the numbers collected at the various dams. Also, based on PIT-tag detections of holdover fall Chinook salmon, it is known that these fish can stop migrating anywhere along their migration route and holdover to the next spring. These two characteristics of fall Chinook life history make it extremely difficult to estimate how many holdover fish will outmigrate in any given year. Therefore, no estimates of holdover yearling fall Chinook salmon are included.

In 2014, 219,670 AD-clipped and 270,330 non-AD-clipped yearling listed hatchery fall Chinook salmon will be released above Lower Granite Dam. Using an average survival rate of 0.876, we estimate that 429,240 (192,431 AD-clipped and 236,809 non-AD-clipped) yearling listed hatchery fall Chinook salmon will arrive at Lower Granite Dam.

Knowing the total number of hatchery fish, the number of listed hatchery fish, and the number of wild fish arriving at Lower Granite Dam, we estimated the percentage composition of listed hatchery fish and wild fish arriving at the dam as follows:

total yearling smolts = total hatchery fish + wild fish =
11,968,629 = (10,171,808 + 429,240) + 1,367,581

% wild fish to dam = wild fish/total smolts =
11.42638% = 1,367,581/11,968,629

% listed hatchery fish = listed hatchery fish/total smolts =

AD-clip spring/summer	19.53101% = 2,337,594/11,968,629
Non-AD-clip spring/summer	3.55471% = 425,450/11,968,629
AD-clip yearling fall	1.60779% = 192,431/11,968,629
Non-AD-clip yearling fall	1.97858% = 236,809/11,968,629

We set fish guidance efficiencies (FGE) at Lower Granite and Little Goose Dams to 0.303 and 0.331, respectively. Using an FGE of 0.303, the total collection at Lower Granite Dam will be 3,626,494 (11,968,629 x 0.303), based on 11,968,629 smolts arriving at the dam. The collection at Lower Granite Dam will be comprised of the following:

Listed groups	Total	Percent
Wild spring/summer	414,377	11.4
AD-clip hatchery spring/summer	708,291	19.5
Non-AD-clip hatchery spring/summer	128,911	3.6
AD-clip hatchery yearling fall	58,306	1.6
Non-AD-clip hatchery yearling fall	71,753	2.0
Unlisted groups		
AD-clip hatchery spring/summer	1,945,774	53.7
Non-AD-clip hatchery spring/summer	299,082	8.2

Tucannon River fish, both hatchery and wild, are within the Snake River spring/summer Chinook salmon Evolutionarily Significant Unit (ESU) and are considered listed fish. In spring 2014, 27,667 wild and 245,000 non-AD-clipped hatchery spring/summer Chinook salmon are expected to outmigrate from the Tucannon River. The Tucannon River joins the Snake River between Little Goose and Lower Monumental Dams. Because of the short distance from the confluence to Lower Monumental Dam, we assumed no mortality of these fish prior to Lower Monumental Dam. The estimates shown in Table 2 and Tables 7-8 reflect the addition of these fish above Lower Monumental Dam.

Since 1995, some of the PIT-tagged fish bypassed at the collection dams (Lower Granite, Little Goose, Lower Monumental, and McNary Dams) have been returned to the river to continue migrating inriver. This return of fish to the river requires adjustment of our estimates of the number of listed fish that reach McNary Dam. We estimated the number of fish that will be PIT-tagged for 2014 and, as described in Appendix A, adjusted for fish diverted to transportation at each Snake River collector dam. If transportation occurs at McNary Dam, we also assumed that 100% of all PIT-tagged fish would be returned to the river. A detailed description of how we estimated the impact of returning PIT-tagged fish to the river is presented in Appendix A. We estimated that 28,469 PIT-tagged spring/summer Chinook salmon from the Snake River (including 12,664 wild and 7,645 listed hatchery fish) will be collected at McNary Dam because they were returned to the river at an upstream dam(s). These numbers represent collected fish. Dividing the collected number by the FGE at McNary Dam (0.308), we determined that 41,117 wild (12,664/0.308) and 24,821 listed hatchery (7,645/0.308) fish will arrive at McNary Dam and must be added to the number of fish that were estimated to reach McNary Dam as a result of not having been collected at an upstream dam (column "Listed fish to McNary", Table 2).

Upper Columbia River ESU

The Upper Columbia River ESU spring Chinook salmon is listed as endangered under the ESA. The ESU begins at the confluence of the Yakima and Columbia rivers and continues upstream to Chief Joseph Dam.

Adults that returned in 2012 produced the smolts that will outmigrate in 2014. We obtained 2012 redd counts for the major Columbia River tributaries in this ESU from Washington Department of Fish and Wildlife (WDFW) and the Yakama Indian Nation. Fecundity estimates for this ESU range from 4,000 to 5,500 eggs per female. Estimates for egg-to-smolt survival generally range up to 19%. Using the median egg count, 4,750, and an egg-to-smolt survival estimate (to the first dam encountered) of 7.5%, we estimated the number of smolts that each stream will produce.

We also have hatchery release estimates for this ESU from WDFW and the U.S. Fish and Wildlife Service. There are no survival

estimates for these hatcheries. So, based on the distance from the hatchery to the first dam the fish will encounter, we assigned the same survival estimates for Snake River hatcheries, with similar distances to the first dam. Using this method, we assigned a survival rate of 0.792 (Dworshak Hatchery's survival estimate to Lower Granite Dam) to the fish from Winthrop, Methow, Entiat, and Leavenworth Hatcheries, a survival estimate of 0.739 (Rapid River Hatchery's estimate to Lower Granite Dam) to Cle Elum Hatchery, and a survival estimate of 100% to Eastbank and Ringold Hatcheries.

We used per-project survival estimates for spring Chinook salmon in the Columbia River above McNary Dam as summarized in the Mainstem Columbia River Hydopower Projects Recovery Plan Module dated 24 September 2008. These survival estimates were: 0.962 for Wells Dam, 0.921 for Rocky Reach Dam, 0.934 for Rock Island Dam, 0.905 for Wanapum Dam and 0.905 Priest Rapids Dam.

In 2014, a total of 2,695,000 AD-clipped and no non-AD-clipped hatchery yearling summer Chinook salmon will be released in the Columbia River above McNary Dam. There are no listed summer Chinook salmon in the Columbia River. Because these fish may not be distinguishable from yearling spring Chinook salmon, they have been included in the yearling estimates detailed below. For the same reasons discussed under the Snake River section above, we were unable to estimate the number of holdover summer Chinook salmon outmigrating through the Columbia River.

Based on the assumptions stated above, we derived the estimates shown in Table 7a and 7b. Based on projected hatchery releases and the number of wild smolts we estimate will outmigrate from the various drainages along the Columbia River above McNary Dam, we estimate that 4,952,696 spring Chinook salmon will arrive at McNary Dam. The composition of fish arriving at McNary Dam will be as follows:

Listed wild spring	390,731
Listed AD-clip hatchery spring	445,091
Listed Non-AD-clip hatchery spring	126,800
Unlisted wild spring	812,606
Unlisted AD-clip hatchery spring	1,755,304
Unlisted Non-AD-clip hatchery spring	0
Unlisted AD-clip hatchery yearling summer	1,422,164
Unlisted Non-AD-clip hatchery yearling summer	

Note that the numbers shown for Columbia River dams above McNary Dam are numbers arriving at the dam and not the numbers collected at the dam. The reason for this is that fish guidance efficiency (FGE) for these dams is either unknown or is currently being evaluated.

Estimate of Fish Arriving at McNary Dam

McNary Dam is the first dam on the Columbia River below the confluence of the Snake River. To obtain an estimate of the number of spring/summer Chinook salmon smolts arriving at McNary Dam, we added the estimated numbers from the Columbia River above McNary Dam (4,952,696) and the Snake River (3,450,737).

We estimate that 8,403,433 (4,952,696 + 3,450,737) spring/summer Chinook salmon smolts will arrive at McNary Dam in 2014, and that 2,588,257 fish will be collected (FGE = 0.308). The collection at McNary Dam will be comprised of the following:

	Snake R. ESU	Upper Col. R. ESU	Total	Percent
Listed groups				
Wild spring/summer	121,142	120,345	241,487	9.3
AD-clip hatchery spring/summer	183,638	137,088	320,726	12.4
Non-AD-clip hatchery spring/summer	80,868	39,054	119,922	4.6
AD-clip hatchery yearling fall	43,565	0	43,565	1.7
Non-AD-clip hatchery yearling fall	67,663	0	67,663	2.6
Unlisted groups				
Wild spring (from Mid-Columbia)	0	250,283	250,283	9.7
AD-clip hatchery spring/summer	491,639	540,634	1,032,273	39.9
Non-AD-clip hatchery spring/summer	74,313	0	74,313	2.9
AD-clip hatchery yearling Col. R. summer	0	438,026	438,026	16.9
Non-AD-clip hatchery Yearling Col. R.				

Summer	0	0	0	0.0

The ratio of Upper Columbia River ESU wild spring Chinook salmon to Snake River ESU wild spring/summer Chinook salmon at McNary, John Day, and The Dalles Dams will be 0.498:0.502 (390,731:393,317). The proportion of Upper Columbia River ESU listed hatchery fish and Snake River ESU listed hatchery fish arriving at McNary, John Day, The Dalles, and Bonneville Dams will be as follows:

	Ad-clipped	Non-AD-clipped
Snake R spring/summers	0.504 (596,227)	0.431 (262,559)
Snake R yearling falls	0.120 (141,444)	0.361 (219,684)
Upper Columbia R springs	0.376 (445,091)	0.208 (126,800)
	1.000	1.000

We received some redd information from Oregon Department of Fish and Wildlife (ODFW) for the John Day River. Using the same redd to smolt calculation as described above (Upper Columbia River ESU, paragraph 2), we added 79,395 wild unlisted fish arriving between McNary and John Day Dams. Hatchery releases between McNary and John Day Dams will total 778,062 (458,984 AD-clipped and 319,078 non-AD-clipped) unlisted spring and 490,476 (255,047 AD-clipped and 235,429 non-AD-clipped) unlisted yearling fall Chinook salmon. We received 2012 redd count data for the Deschutes River from ODFW (Streamnet), which resulted in an estimated 43,819 wild unlisted fish being added between John Day and The Dalles Dams. Based on data from WDFW (Streamnet), we estimate that 47,738 wild unlisted spring Chinook salmon will be added (from the Klickitat River) between The Dalles and Bonneville Dams. Hatchery releases between John Day and The Dalles Dams will total 951,328 (all AD-clipped) unlisted spring Chinook salmon. Hatchery releases between The Dalles and Bonneville Dams will total 2,751,830 (all AD-clipped) unlisted spring Chinook salmon.

Lower Columbia River ESU

The Lower Columbia River ESU extends from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. This ESU includes wild and hatchery spring-run and fall-run Chinook salmon. The fall-run fish will be discussed below under the subyearling fall Chinook

salmon section. We have received information that spawning is occurring in the Wind River, however, these spring Chinook are not considered to be part of the ESU even though they are naturally produced. We estimate that 2,088 wild spring Chinook salmon will be produced above Bonneville Dam. Also, 2,751,830 unlisted AD-clipped hatchery spring Chinook salmon will be released above Bonneville Dam. This ESU will introduce 1,689,252 wild, 4,068,267 listed hatchery (3,717,135 AD-clipped and 351,132 non-AD-clipped), and 2,171,555 (2,141,888 AD-clipped and 29,667 non-AD-clipped) unlisted hatchery spring Chinook salmon to the Columbia River below Bonneville Dam.

Estimate of Fish Arriving at Bonneville Dam

At Bonneville Dam, the ratio of Upper Columbia River ESU, Snake River ESU, and Lower Columbia River ESU listed wild fish will be 0.496:0.500:0.004 (284,843:286,728:2,088).

Fish transported from Snake River dams and McNary Dam are released below Bonneville Dam. Transportation at McNary Dam does not occur during the spring migration; therefore, all transported fish are from the Snake River ESU. The number of listed transport fish returned to the river will be 2,808,977. The composition of these fish will be as follows:

Snake River ESU (Total number = 2,808,977)	
Listed wild spring/summers	807,720
Listed AD-clip hatchery spring/summers	1,371,123
Listed Non-AD-clip hatchery spring/summers	298,794
Listed AD-clip hatchery yearling falls	142,189
Listed Non-AD-clip hatchery yearling falls	189,151

A total of 7,154,617 (2,808,977 listed + 4,345,640 unlisted fish) transported yearling Chinook salmon will be released below Bonneville Dam.

Upper Willamette River ESU

The Upper Willamette River ESU contains spring Chinook salmon populations above Willamette Falls. This ESU will introduce 635,996 listed wild, 5,575,565 listed hatchery (5,535,072 AD-clipped and 40,493 non-AD-clipped), and no unlisted hatchery spring Chinook salmon to the Columbia River below Bonneville Dam.

The ratio of Upper Columbia River ESU, Snake River ESU, Lower Columbia River ESU, and Upper Willamette River ESU listed wild fish at Tongue Point will be 0.057:0.220:0.339:0.384 (284,843:1,094,448:1,691,340:1,917,063). The proportion of Upper Columbia River ESU, Snake River ESU, Lower Columbia River ESU, and Upper Willamette River ESU listed hatchery fish at Tongue Point will be as follows:

	Ad-clipped		Non-AD-clipped	
Upper Columbia R spring	0.028	(324,472)	0.070	(92,437)
Snake R spring/summer	0.155	(1,805,773)	0.370	(490,200)
Lower Columbia R spring	0.320	(3,717,135)	0.265	(351,132)
Upper Willamette R spring	0.476	(5,535,072)	0.031	(40,493)
Snake R yearling fall	0.021	(245,302)	0.264	(349,301)
	1.000		1.000	

The per-project survival estimate remained the same (0.900) (Table 2).

Summary

Tables 7a, 7b, 8a, and 8b present a summary of the estimated number of fish that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the dams during 2014. This information is derived from the data shown in Tables 1-2 and Appendix Table A1. Table 11 shows the estimated number of listed spring, spring/summer, and yearling fall Chinook salmon expected to outmigrate from each ESU.

COHO SALMON ESTIMATES

Lower Columbia River coho salmon were listed under the Endangered Species Act in June 2005. The Lower Columbia River ESU extends from the mouth of the Columbia River to the Big White Salmon River on the Washington State shore and the Hood River on the Oregon shore. It includes the Willamette River to Willamette Falls, Oregon. This ESU includes both wild and hatchery-origin coho salmon.

Hatchery coho salmon are released in the Snake River and the Columbia River above the Lower Columbia River ESU. At this time we have no estimates of wild coho salmon from these areas; therefore, we have included no wild information in Table 7c. As with yearling and subyearling Chinook salmon, hatchery fish must be tracked based on whether they have an adipose-fin clip.

We assigned coho salmon the same survival rates as yearling Chinook salmon in all our calculations. Enough coho have been released over the past couple years that we are able to estimate FGE at Lower Granite Dam at 0.303. Also, as with the other species discussed here, all our calculations are based on the "Transportation with Spill" scenario.

Based on hatchery outplanting records, we estimate that 807,397 hatchery coho salmon (all non-AD-clipped) will be released into the Snake River drainage. We estimate that 6,878,741 hatchery coho salmon (4,734,672 AD-clipped and 2,144,069 non-AD-clipped) will be released into the Columbia River drainage above the Lower Columbia River ESU. From these releases, we estimate that 6,457,242 hatchery coho salmon (4,398,103 AD-clipped and 2,059,139 non-AD-clipped) will reach Tongue Point.

Lower Columbia River ESU

With the June 2005 change in ESU listing status, all hatchery coho in this ESU are now listed (except those released at Youngs Bay, Tongue Point, and Blind Slough in Oregon and Deep River in Washington). We obtained wild and hatchery coho salmon production estimates for 2014 from the various agencies involved in the lower Columbia River system. From the information provided, we estimate that 95,496 listed wild coho salmon will

arrive at Bonneville Dam. No listed hatchery fish are released above Bonneville Dam.

Listed wild coho salmon estimates from below Bonneville Dam to Tongue Point are 518,230, while listed hatchery releases in this area are 8,518,430 (8,137,485 AD-clipped and 380,945 non-AD-clipped) and 2,161,043 unlisted (all AD-clipped).

In addition, another 5,850 listed wild and 774,533 hatchery (all unlisted AD-clipped) coho salmon will enter the Columbia River below Tongue Point.

Summary

Tables 7c, 8a, and 8b present a summary of the estimated number of fish that will be collected, or will be arriving, at various locations during 2014. Table 11 shows the estimated number of listed coho salmon expected to outmigrate from the Lower Columbia River ESU.

SUBYEARLING FALL CHINOOK SALMON ESTIMATES

To estimate the 2014 collection number at Lower Granite Dam, we used the 2013 collection number and the adult returns over the dam for 2012 and 2013. In 2013, a total of 905,697 unmarked hatchery subyearling fall Chinook salmon were released above Lower Granite Dam. Assuming a survival rate of 0.770 (the estimated survival rate of hatchery subyearling fall Chinook salmon released above Lower Granite Dam in 2013), a total of 697,085 (905,697 x 0.770) of these fish would have arrived at Lower Granite Dam. Assuming an FGE of 0.249 (derived from PIT-tagged hatchery subyearling fall Chinook salmon in 2013), a total of 173,574 (697,085 x 0.249) would have been collected at Lower Granite Dam. Through December 31, 2013 a total of 241,822 unclipped (and without a coded-wire tag) subyearling Chinook salmon had been collected at Lower Granite Dam. By removing the estimated 173,574 unmarked hatchery subyearling fall Chinook salmon, we estimate that 68,248 (241,822 - 173,574) wild subyearling fall Chinook salmon were collected at Lower Granite Dam in 2013. These wild subyearling fall Chinook salmon were from the 2012 adult return. The adult count over Lower Granite Dam in 2012 was 35,146. Of these, 5,057 were hatchery fish that were returned to Lyons Ferry Hatchery and 30,089 adults were passed above Lower Granite Dam. The 2014 outmigration will be the result of the 2013 adults that passed over Lower Granite Dam. Through December 31, 2013, a total of 56,962 adults had been counted in the adult ladder. Of these, 1,817 fish were returned to Lyons Ferry Hatchery, leaving 55,145 adults that were passed above Lower Granite Dam. The 2013 count of 55,145 adults represents 183.3% of the 2012 count (30,089). We applied this change (183.3%) to the 2013 subyearling collection number to arrive at the estimated 2014 collection number.

$$\left(\begin{array}{l}\text{total wild fall}\\ \text{Chinook}\\ \text{collected at}\\ \text{Granite}\end{array}\right) = \left(\begin{array}{l}\text{wild fall}\\ \text{Chinook}\\ \text{collected in}\\ 2013\end{array}\right) \times \left(\begin{array}{l}\text{\% change between adult}\\ \text{counts for 2013 and 2014}\\ \text{outmigrations}\end{array}\right) =$$

$$125{,}099 = 68{,}248 \times 1.833$$

We estimated the total number of wild subyearling fall Chinook salmon arriving at Lower Granite Dam by dividing the number of wild fish collected by the FGE at Lower Granite Dam. The average estimated FGE for PIT-tagged hatchery subyearling fall Chinook salmon arriving at Lower Granite Dam from 2006-2013

(after onset of court ordered spill) is 0.249. Therefore, the total wild fall Chinook = total wild fall Chinook collected/FGE, or 502,406 fish (125,099/0.249).

The Nez Perce Tribe along with WDFW will release 4,410,000 listed subyearling fall Chinook salmon in the Clearwater and Snake Rivers in 2014. Of these fish, 2,100,000 will be AD-clipped and 2,310,000 will be non-AD-clipped. Assuming a survival rate of 0.776 (the average estimated survival rate of PIT-tagged hatchery subyearling fall Chinook salmon released above Lower Granite Dam from 1995-2013 (excluding 2001)), 3,422,160 (4,410,000 x 0.776) of the 4,410,000 hatchery fish will arrive at Lower Granite Dam. Of these fish, 1,629,600 will be AD-clipped and 1,792,560 will be non-AD-clipped. By adding the non-AD-clipped fish to the total number of wild fall Chinook salmon (502,406), we estimate that 2,294,966 non-AD-clipped subyearling fall Chinook salmon will arrive at Lower Granite Dam. The percentage of non-AD-clipped subyearling fall Chinook salmon that are wild will be 21.8917% (502,406/2,294,966). We added the total AD-clipped hatchery fish (1,629,600), the total non-AD-clipped hatchery fish (1,792,560), and the total wild fish (502,406) to determine the total number of subyearling fall Chinook salmon arriving at Lower Granite Dam (3,924,566).

Knowing the total number of hatchery fish, the number of listed hatchery fish, and the number of wild fish arriving at Lower Granite Dam, we estimated the percentage composition of listed hatchery fish and wild fish arriving at the dam as follows:

% listed fish = listed fish/total smolts =

Wild subyearling fall	12.8016% = 502,406/3,924,566
AD-clip subyearling fall	41.5231% = 1,629,600/3,924,566
Non-AD-clip subyearling fall	45.6753% = 1,792,560/3,924,566

We set FGEs at Lower Granite and Little Goose Dams to 0.249 and 0.317, respectively. Using an FGE of 0.249, the total collection at Lower Granite Dam will be 977,217 (3,924,566 x 0.249), based on 3,924,566 smolts arriving at the dam. The collection at Lower Granite Dam will be comprised of the following:

Listed wild subyearling fall	125,099
Listed AD-clip hatchery subyearling fall	405,770
Listed Non-AD-clip hatchery subyearling fall	446,347

NMFS has conducted subyearling fall Chinook salmon survival tests since 1995. As part of these tests, we estimated actual FGEs for McNary Dam (factoring in effects of spill). To more accurately estimate the collection number at McNary Dam, we averaged these actual FGEs for 2006-2013, since the onset of court ordered spill. We also averaged the number of fall Chinook salmon adults crossing McNary Dam for each of the brood years (2002-2013) and the number of juvenile subyearling fall Chinook salmon collected at McNary Dam (2002-2013). The 2013 count of 454,991 adults represents 276.8% of the average for 2002-2013 count (164,384). We applied this change (276.8%) to the average 2002-2013 subyearling collection number (3,424,984) to arrive at an estimated 2014 collection number of 9,480,356 (3,424,984 x 2.768).

Based on the NMFS subyearling fall Chinook salmon survival studies conducted from 2006-2013, per-project survival was set at 75%. We set the FGEs at Little Goose, Lower Monumental, and McNary Dams, based on 2006-2013 NMFS fall Chinook salmon survival study results (since court ordered spill was initiated), to 0.317, 0.169, and 0.192, respectively.

Lower Columbia River ESU

The Lower Columbia River ESU includes both wild and hatchery tule and late-run bright fall Chinook salmon, including fall Chinook salmon from the Clackamas River.

To determine the number of wild outmigrants from this ESU, we assumed that 50% of the adults counted in the spawning areas were female and that every female spawned successfully. We used average fecundity and set the egg-to-smolt survival rate at 15%, the same used for spring/summer Chinook salmon.

Based on these assumptions, we estimate that 506,572 tule fall Chinook salmon will outmigrate from above Bonneville Dam. No late-run bright fish will enter the Columbia River above Bonneville Dam. Additionally, we estimate that 7,534,738 tule fall Chinook salmon and 2,799,724 late-run bright fall Chinook salmon will enter the Columbia River below Bonneville Dam.

The ratio of Snake River ESU and Lower Columbia River ESU (tule fall Chinook salmon) listed wild fish at Bonneville Dam will be 0.052:0.948 (27,877:506,572).

With the June 2005 change in ESA listing status, most hatchery fish released in this ESU are now listed. In 2014, hatchery releases above Bonneville Dam will total 10,753,340 listed tule (10,348,783 AD-clipped and 404,557 non-AD-clipped) and 10,645,000 unlisted (8,302,674 AD-clipped and 2,342,326 non-AD-clipped) subyearling fall Chinook salmon. Below Bonneville Dam releases totaled 24,449,274 listed tule (24,149,924 AD-clipped and 299,350 non-AD-clipped) and 4,362,112 unlisted (1,161,110 AD-clipped and 3,201,002 non-AD-clipped) subyearling fall Chinook salmon.

The ratio of Snake River ESU and Lower Columbia River ESU (tule fall Chinook salmon) listed hatchery AD-clipped fish at Bonneville Dam will be 0.010:0.990 (106,785:10,348,783), while the ratio for hatchery non-AD-clipped fish at Bonneville Dam will be 0.169:0.831 (82,409:404,557).

Fish transported from Snake River dams and McNary Dam are released below Bonneville Dam. The number of listed transport fish returned to the river will be 260,074 wild, 870,142 AD-clipped, and 900,233 non-AD-clipped fish, all from the Snake River ESU. A total of 11,388,538 transported subyearling fall Chinook salmon will be released below Bonneville Dam.

The ratio of Snake River ESU, Lower Columbia River ESU (tule fall Chinook salmon), and Lower Columbia River ESU (late-run bright fall Chinook salmon) listed wild fish at Tongue Point will be 0.026:0.722:0.252 (287,951:8,041,310:2,799,724). The proportion for hatchery fish at Tongue Point will be as follows:

	Ad-clipped		Non-AD-clipped	
Snake R. subyearling fall	0.028	(976,927)	0.583	(982,641)
Lower Columbia R. subyearling fall - Tule	0.972	(34,498,707)	0.417	(703,907)

Lower Columbia R. subyearling fall - Late run		0.000	(0)	0.000
	1.000	1.000		

Summary

Tables 7a, 7b, 8a, and 8b present a summary of the estimated number of fish that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the dams during 2014. This information is derived from the data shown in Table 2. Table 11 shows the estimated number of subyearling fall Chinook salmon expected to outmigrate from each ESU.

SOCKEYE SALMON ESTIMATES

The sockeye salmon collection count at Lower Granite Dam is based on IDFG's estimate of wild and hatchery-reared sockeye salmon smolts exiting the upper Salmon River in 2014 and IDFG and NOAA Fisheries estimates of survival to Lower Granite Dam. We estimate that 21,929 wild fish and 138,343 hatchery fish will survive to Lower Granite Dam in spring 2014. All of these fish are listed as endangered.

listed sockeye (wild and hatchery) to Lower Granite Dam =
IDFG's estimated wild fish + estimated hatchery fish =
160,272 = 21,929 + 138,343

To determine the percentage of wild sockeye salmon collected at Lower Granite Dam, we estimated the number of kokanee arriving at Lower Granite Dam. In 2013, WDFW staff at Lower Granite Dam estimated that 2,207 kokanee were collected. With an FGE of 0.276 (the 2013 estimate), 7,996 (2,207/0.276) kokanee reached Lower Granite Dam. Assuming the same amount of spill from Dworshak Dam in 2014 with a release of the same number of kokanee, we estimated the total number of wild *O. nerka* arriving at Lower Granite Dam to be 29,925 (7,996 + 21,929). We then estimated the percentage of wild *O. nerka* arriving at Lower Granite Dam that will be listed Snake River sockeye salmon.

% listed wild sockeye =
listed wild sockeye/total wild *O. nerka* to Lower Granite Dam =
73.3% = 21,929/29,925

A total of 168,268 (160,272 listed sockeye + 7,996 kokanee) *O. nerka* will arrive at Lower Granite Dam.

% total listed sockeye =
total listed sockeye/total *O. nerka* to Lower Granite Dam =
95.2% = 160,272/168,268

An FGE of 0.276 (average for 1998-2013 (excluding 2001)) was used to estimate the number of *O. nerka* smolts reaching Lower Granite Dam that will be collected.

O. nerka salmon collected = total *O. nerka* salmon x FGE =
46,442 = 168,268 x 0.276

Because of extreme year-to-year variability, the count used at McNary Dam for 2014 is based on the average of the counts at the dam from 1992 to 2013 (398,635). Project survival was set at the yearling Chinook salmon level (Table 2).

Summary

Table 7c presents a summary of the estimated number of fish that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the dams during 2014. This information is derived from the data shown in Table 2. Table 11 shows the estimated number of sockeye salmon expected to outmigrate from the Snake River ESU.

STEELHEAD ESTIMATES

Introduction

Because of the time of year that steelhead spawn, it is very difficult to obtain redd count information. All of our steelhead estimates, not otherwise explained, are based on adult counts in the spawning areas. We assumed that 65% of the adults were females and that every female spawned successfully. To estimate the number of outmigrants, we used average fecundity estimates, and assigned an egg-to-smolt survival rate of 0.6%. This survival rate is within the range of rates we calculated or found in the literature, which were from 0.5% to 0.75%.

Snake River Steelhead ESU

Prior to the 2001 outmigration, nearly all hatchery steelhead were fin-clipped, allowing us to use the juvenile collection numbers at Lower Granite Dam without making any adjustments for unclipped hatchery fish. Because it was known that a large number of unclipped steelhead were to be released for the 2013 outmigration, WDFW not only recorded the number of unclipped steelhead collected but also the number of unclipped steelhead that had fin erosion, a strong indicator that a fish is of hatchery origin. Based on the information provided by WDFW (Fred Mensik, WDFW, Pers. commun., March 2014), we determined that 268,588 wild steelhead were collected at Lower Granite Dam in 2013 (0.304, or 117,559, of the 386,147 unclipped steelhead collected at Lower Granite Dam in 2013 had fin erosion). We applied the 2013 estimated FGE (0.231) to the collection number to determine that 1,162,719 (268,588/0.231) wild steelhead arrived at Lower Granite Dam in 2013.

We based our age-class distribution of migrating juvenile steelhead in the Snake River on a two year average of data from the Wild juvenile steelhead and Chinook salmon abundance and composition at Lower Granite Dam, migratory years 2010 and 2011; Idaho Department of Fish and Game Report 13-17 (available on IDFG website). For this memo the age-class percentage estimates are: 3.5% age-1, 50.4% age-2, 39.1% age-3, and 6.8% age-4 smolts. The age-class of the remainder of smolts was made up by fish either less than one year or greater than age-4. Because of this age-class breakdown, we decided to base our estimates on age-classes 1 to 4. Because steelhead spawn in the spring, our annual counts were from July 1 to June 30, rather than by

calendar year. Using the adult counts at Lower Granite Dam of the 4 years that comprised the 2013 wild smolt outmigration (2008-2012 brood years, July 1, 2007-June 30, 2012), and applying the smolt age-class percentages to the adult counts for each of these 4 years, we estimated that 249,763 of the adults passing Lower Granite Dam produced the 2013 steelhead outmigration. We performed the same calculation to estimate the number of adults from the 4 years (2009-2013 brood years) producing the 2014 wild outmigration. We calculated that the 2014 wild outmigration will be based on 198,124 adults, or 79.3% of the number of fish producing the 2013 outmigration. We applied the change in the number of adults to the number of wild steelhead that arrived at Lower Granite Dam in 2013 (1,162,719) to determine the estimated 2014 arrival number.

(total wild steelhead arriving at Lower Granite) = (wild steelhead arriving in 2013) x (% change between adult counts for 2013 and 2014 outmigrations) =

922,036 = 1,162,719 x 0.793

For the steelhead hatchery release numbers, we used IDFG's, ODFW's, and WDFW's estimates of hatchery releases in Idaho, Oregon, and Washington. We estimate that 9,102,131 hatchery smolts (Table 4) will be released from Idaho (7,877,131), Oregon (1,015,000), and Washington (210,000)above Lower Granite Dam.

In order to estimate how many hatchery smolts will reach Lower Granite Dam, we used the survival estimates for the 2006-2013 outmigrations (from the NMFS survival study, Research Action #1212). Using the 2014 projected release number and survival estimate for each hatchery, we estimated how many total hatchery fish will arrive at Lower Granite Dam. We estimate that 7,136,885 or 78.4089% of the 9,102,131 hatchery fish released will arrive at the dam (Table 4).

Knowing the numbers of hatchery and wild fish arriving at Lower Granite Dam, we estimated the percentage composition of listed wild fish arriving at the dam as follows:

total smolts = total hatchery fish + wild fish =
8,058,921 = 7,136,885 + 922,036

% wild fish to Lower Granite Dam = wild fish/total smolts =
11.44118% = 922,036/8,058,921

% listed hatchery fish = listed hatchery fish/total smolts =

AD-clip summer	29.16850% = 2,350,666/8,058,921
Non-AD-clip summer	3.98395% = 321,063/8,058,921

We set FGEs at Lower Granite and Little Goose Dams at 0.330 and 0.380, respectively. Using an FGE of 0.330, the total collection at Lower Granite Dam will be 2,659,444 (8,058,921 x 0.330), based on 8,058,921 smolts arriving at the dam. The collection at Lower Granite Dam will be comprised of the following:

	Number	Percent
Listed wild	304,272	11.4
Listed hatchery AD-clip	775,720	29.2
Listed hatchery Non-AD-clip	105,951	4.0
Unlisted hatchery AD-clip	1,310,266	49.3
Unlisted hatchery Non-AD-clip	163,235	6.1

Wild/natural Tucannon River drainage fish are listed within the Snake River ESU. In spring 2014, 21,143 wild fish are expected to outmigrate from the Tucannon River. In addition, 91,000 (41,000 AD-clipped and 50,000 non-AD-clipped) listed hatchery fish and 117,500 (all AD-clipped) unlisted hatchery fish will be released into the Tucannon River or released directly from Lyons Ferry Hatchery. The Tucannon River joins the Snake River between Little Goose and Lower Monumental Dams. Because of the short distance from the confluence to Lower Monumental Dam, we assumed no mortality of these fish prior to Lower Monumental Dam. The estimates shown in Table 5 and Tables 9-10 reflect the addition of these fish above Lower Monumental Dam.

Except when research studies require an alternate disposition, all PIT-tagged fish bypassed at the collection dams (Lower Granite, Little Goose, Lower Monumental, and McNary Dams) are returned to the river to continue migrating inriver. This return of fish to the river requires adjustment of our estimates of the number of listed fish that reach McNary Dam. We estimated the number of fish that will be PIT tagged for 2014 and, as described in Appendix B, adjusted for fish diverted to transportation at each Snake River collector dam. A detailed

description of how we estimated the impact of returning PIT-tagged fish to the river is presented in Appendix B. We estimated that 13,598 PIT-tagged steelhead from the Snake River (including 2,313 wild fish) will be collected at McNary Dam because they were returned to the river at an upstream dam(s). These numbers represent collected fish. Dividing the collected number by the FGE at McNary Dam (0.177), we determined that 13,068 wild Snake River steelhead (2,313/0.177) will arrive at McNary Dam and must be added to the number of fish that were estimated to reach McNary Dam as a result of not having been collected at an upstream dam (column "Listed fish to McNary", Table 5).

Upper-Columbia River ESU Steelhead

Very little is known regarding wild steelhead in the Columbia River above the confluence with the Yakima River. Also, little is known regarding dam passage of smolts at the dams above McNary Dam. Because of this lack of information, the estimates of wild steelhead from the listed Upper Columbia River ESU are based on what little information is available and on broad generalizations based on this information. No FGE's have been established for the dams in this reach, so the numbers presented in this section of the memorandum (and in Tables 9 and 10) are the number of fish arriving at the dam, not collection numbers (unless otherwise noted in the text).

Pevan et al. (1994) showed that migrating steelhead were 0.7% age-1, 43.2% age-2, 46.4% age-3, and 8.6% age-4 smolts. The age-class of the remainder of smolts (1.1%) was greater than age-4, up to age-7. Because of this age-class breakdown, we decided to base our estimates on age-classes 1 to 4.

We based our estimates of wild fish on counts collected at Rock Island Dam by the Fish Passage Center. During the 2013 outmigration, 5,673 wild steelhead smolts were counted in the Smolt Monitoring Program's sample. It is estimated that the sample represents 3-5% of the fish passing the dam. Using a 4% sample rate, we estimated that 141,825 wild steelhead passed Rock Island Dam in 2013.

We then examined the adult counts at Rock Island Dam. Because steelhead spawn in the spring, our annual counts were from July 1 to June 30, rather than by calendar year. Using the adult counts of the 4 years that comprised the 2013 wild smolt

outmigration (2008-2012 brood years, July 1, 2007-June 30, 2012), and applying the smolt age-class percentages to the adult counts for each of these 4 years, we estimated that 28,595 of the adults passing Rock Island Dam produced the 2013 steelhead outmigration. We performed the same calculation to estimate the number of adults from the 4 years (2009-2013 brood years) producing the 2014 wild outmigration. We calculated that the 2014 wild outmigration will be based on 21,896 adults, or 0.766 of the number of fish producing the 2013 outmigration. We applied the change in the number of adults to the 2013 Rock Island Dam collection to arrive at the estimated 2014 collection number.

(total wild steelhead collected at Rock) = (wild steelhead collected in 2013) x (% change between adult counts for 2013 and 2014) =

4,346 = 5,673 x 0.766

Since this represents 4% of the fish passing the dam, we estimate that 108,650 wild steelhead smolts will pass the dam in 2014. Using the smolt age-class percentages, we estimate that 761 smolts will be age-1, 46,937 will be age-2, 50,414 will be age-3, and 9,344 will be age-4, and 1,195 will be age-5 and older.

To determine the number of wild smolts passing the two dams above Rock Island Dam (Rocky Reach and Wells Dams), we used the estimate of wild smolts passing Rock Island Dam (108,650) and the adult counts at all three dams.

By comparing the adult counts at each of the three dams for the 4 years that will produce the 2014 outmigration (2009-2013), we calculated the number of adults "lost" between each dam. We assigned this "loss" to adults migrating up rivers between the dams. The difference in adult counts between dams varied between years, so we applied the age-class percentages to each year's differences between dams to determine the number of wild smolts added from the rivers between the dams.

From Rock Island Dam to McNary Dam, the only adjustment made to the wild steelhead smolt count was for per-project survival.

To determine the number of hatchery smolts arriving at each dam in 2014, we used the outplanting data for the 3 years comprising

the 2014 outmigration (2012-2014). Because hatchery fish are larger than equivalent age-class wild fish, we assigned age-2 status to hatchery fish released in 2014, age-3 to those released in 2013, and age-4 to those released in 2012. All of the hatchery outplants will be of listed hatchery stocks.

Because there are no survival data for the various hatcheries releasing fish in this section of the Columbia River, we assumed that all fish released survived to the first dam. We again applied the age-class percentages to the number of fish released each of the 3 years to determine the number of hatchery fish that would outmigrate in 2014. Beginning at Wells Dam and assuming 90% per-project survival, we determined both the number of listed hatchery and the total number of hatchery fish reaching each dam through McNary Dam (Tables 5 and 9).

Mid-Columbia River ESU Steelhead

The Mid-Columbia River wild summer-run and winter-run steelhead are listed protected species. With the January 2006 listings, some hatchery steelhead in this ESU are now listed. Only summer steelhead from the Yakima and Walla Walla Rivers enter the Columbia River above McNary Dam.

Based on our assumptions described in the steelhead introduction, 115,301 wild summer steelhead will enter above McNary Dam in 2014.

WDFW will release 50,000 (all non-AD-clipped) listed (from Mid-Columbia River ESU stock) and 90,000 (all AD-clipped) unlisted hatchery steelhead (Lyons Ferry Hatchery stock) into the Touchet River, a tributary of the Walla Walla River, and 107,500 (all AD-clipped) non-listed hatchery steelhead (from Mid-Columbia River ESU stock) into the Walla Walla River. The Walla Walla River enters the Columbia River above McNary Dam. For these fish, survival to McNary Dam was set at 100%.

An additional 135,629 wild steelhead from this ESU will be added between McNary and John Day Dams. Hatchery summer steelhead will be released between McNary and John Day Dams. Release numbers will be as follows:

Summer Steelhead	
Listed hatchery AD-clip	164,400

Between John Day and The Dalles Dams, 84,121 wild and 192,676 listed hatchery (174,159 AD-clipped and 10,517 non-AD-clipped) summer steelhead will be added. Between The Dalles and Bonneville Dams, 60,353 wild winter, 90,000 (all AD-clipped) unlisted hatchery summer, and no unlisted hatchery winter steelhead will be added.

Estimate of Fish Arriving at McNary Dam

McNary Dam is the first dam on the Columbia River below the confluence of the Snake River. To obtain an estimate of the number of steelhead smolts arriving at McNary Dam, we added the estimated numbers from the Upper Columbia River (1,048,638), Mid-Columbia (115,301) and the Snake River (1,836,198) ESUs.

We estimate that 3,000,137 (1,048,638 + 115,301 + 1,836,198) steelhead smolts will arrive at McNary Dam in 2014, and that 531,024 fish will be collected. Of the 531,024 smolts collected at McNary Dam, 71,667 (0.135) will be wild (13,741 Upper Columbia River ESU, 37,518 Snake River ESU, and 20,408 Mid-Columbia River ESU), 165,374 (0.311) will be listed hatchery AD-clipped (72,743 Upper Columbia River ESU, 92,631 Snake River ESU, and no Mid-Columbia River ESU), 52,776 (0.099) will be listed hatchery non-AD-clipped (27,137 Upper Columbia River ESU, 16,789 Snake River ESU, and 8,850 Mid-Columbia River ESU), and 285,016 (0.537) will be unlisted hatchery fish (255,859 AD-clipped and 29,157 non-AD-clipped). The ratio of Upper Columbia River ESU wild fish, Snake River ESU wild fish and Mid-Columbia River ESU wild fish at McNary, John Day, and The Dalles Dams will be as follows:

	McNary Dam		John Day		The Dalles	
Upper Columbia	0.192	(77,630)	0.144	(69,867)	0.123	(62,880)
Snake River	0.523	(211,968)	0.392	(190,771)	0.334	(171,694)
Mid-Columbia						
Summer	0.285	(115,301)	0.464	(225,837)	0.543	(278,962)
Winter	—		—		—	
	1.000		1.000		1.000	

The proportion of Upper Columbia River ESU, Snake River ESU, and Mid-Columbia River ESU hatchery fish at McNary, John Day, and The Dalles Dams will be as follows:

	McNary Dam		John Day		The Dalles	
Upper Columbia						
AD-clipped	0.440	(410,976)	0.368	(369,878)	0.308	(332,890)
Non-AD-clipped	0.514	(153,315)	0.514	(137,984)	0.493	(124,186)
Snake River						
AD-clipped	0.560	(523,338)	0.468	(471,004)	0.393	(423,904)
Non-AD-clipped	0.318	(94,851)	0.318	(85,366)	0.305	(76,829)
Mid-Columbia						
Summer						
AD-clipped	0.000	(0)	0.164	(164,400)	0.299	(322,119)
Non-AD-clipped	0.168	(50,000)	0.168	(45,000)	0.202	(51,017)
Winter						
AD-clipped	0.000	(0)	0.000	(0)	0.000	(0)
Non-AD-clipped	0.000	(0)	0.000	(0)	0.000	(0)

Lower Columbia River ESU Steelhead

We estimate that 34,146 (19,469 summer and 14,677 winter) wild steelhead from this ESU will arrive at Bonneville Dam. With the January 2006 listings, some hatchery steelhead in this ESU are now listed. Because the hatchery steelhead are denoted as of summer or winter stock, we have decided to track each run individually. At Bonneville Dam, the proportion of wild fish in the various ESUs will be as follows:

Upper Columbia	0.102	(56,592)
Snake River	0.278	(154,525)
Mid-Columbia		
summer	0.451	(251,066)
winter	0.108	(60,353)
Lower Columbia		
summer	0.035	(19,469)
winter	0.026	(14,677)
	1.000	

Between The Dalles and Bonneville Dams, no unlisted hatchery summer steelhead will be added. There will be 50,000 AD-clipped winter steelhead released above Bonneville Dam from this ESU. At Bonneville Dam, the proportion of hatchery fish in the various ESUs will be as follows:

	Bonneville Dam
Upper Columbia	
AD-clipped	0.293 (299,601)
Non-AD-clipped	0.493 (111,767)
Snake River	
AD-clipped	0.374 (381,514)
Non-AD-clipped	0.305 (69,146)
Mid-Columbia	
Summer	
AD-clipped	0.284 (289,907)
Non-AD-clipped	0.202 (45,915)
Winter	
AD-clipped	0.000 (0)
Non-AD-clipped	0.000 (0)
Lower Columbia	
Summer	
AD-clipped	0.000 (0)
Non-AD-clipped	0.000 (0)
Winter	
AD-clipped	0.049 (50,000)
Non-AD-clipped	0.000 (0)

Another 278,541 (25,285 summer and 253,256 winter) wild steelhead are expected to enter the Columbia River from Washington and Oregon downstream from Bonneville Dam.

Fish transported from Snake River dams are released below Bonneville Dam. The number of listed transport fish returned to the river will be 2,484,989 (636,580 wild, 1,618,207 AD-clipped hatchery, and 230,202 non-AD-clipped hatchery), all from the Snake River ESU. A total of 5,267,851 transported steelhead will be released below Bonneville Dam.

Upper Willamette River ESU

The Upper Willamette River wild winter-run steelhead are listed protected species. With the January 2006 listings, some hatchery steelhead in this ESU are now listed. Because the

hatchery steelhead are denoted as of summer or winter stock, we have decided to track each run individually.

Based on our assumptions described in the steelhead introduction, 183,859 winter steelhead will enter the Columbia River in 2014, 143,898 of which will be from listed stocks.

At Tongue Point the proportions of wild fish from the various ESUs will be as follows:

	Tongue Point	
Upper Columbia	0.035	(56,592)
Snake River	0.490	(791,105)
Mid-Columbia		
summer	0.155	(251,066)
winter	0.037	(60,353)
Lower Columbia		
summer	0.028	(44,754)
winter	0.166	(267,933)
Upper Willamette		
summer	0	(0)
winter	0.089	(143,898)
	1.000	

Listed hatchery releases from this ESU will total 175,264 (all AD-clipped) summer and no winter steelhead. At Tongue Point the ratios of listed hatchery fish from the various ESUs will be as follows:

	Tongue Point	
Upper Columbia		
AD-clipped	0.072	(299,601)
Non-AD-clipped	0.243	(111,767)
Snake River		
AD-clipped	0.484	(1,999,721)
Non-AD-clipped	0.652	(299,348)
Mid-Columbia		
Summer		
AD-clipped	0.070	(289,907)
Non-AD-clipped	0.100	(45,915)
Winter		
AD-clipped	0.000	(0)
Non-AD-clipped	0.000	(0)
Lower Columbia		
Summer		
AD-clipped	0.022	(91,800)
Non-AD-clipped	0.000	(0)
Winter		
AD-clipped	0.310	(1,280,244)
Non-AD-clipped	0.002	(971)
Upper Willamette		
Summer		
AD-clipped	0.042	(174,037)
Non-AD-clipped	0.003	(1,227)
Winter		
AD-clipped	0.000	(0)
Non-AD-clipped	0.000	(0)

Summary

Tables 9 and 10 summarize the estimated number of steelhead that will be collected, or will be arriving (Columbia River dams above McNary Dam), at each of the collection dams during 2014. This information is derived from the data shown in Tables 4-5 and Appendix Table B1. Table 11 shows the estimated number of steelhead expected to outmigrate from each ESU.

CHUM ESTIMATES

Columbia River ESU

Wild and all hatchery chum salmon in the Columbia River are listed protected species.

To estimate wild chum salmon outmigration, we used a five year average of available adult data (Streamnet) for the Grays and lower Columbia river systems. We assumed 50% of the adults were females and that every female spawned successfully. To estimate the number of outmigrants, we used an average fecundity estimate of 3000, and assigned an egg-to-smolt rate 0.30%. We estimate a total of 4,608,900 (3,030,300 Grays River and 562,500 Columbia River) wild chum salmon outmigrating in 2014.

We expect the hatchery (all non-AD-clipped) chum salmon outmigration to be 525,863 (175,000 from the Columbia River, 100,863 from Chinook River, and 250,000 from Grays River). This provides an overall estimate of 5,134,763 (4,608,900 + 525,863) listed chum salmon outmigrating in 2014.

Full Transportation Scenario

The estimates shown in Tables 3 and 6 were derived using the same methodology utilized under the Transportation with Spill Scenario, with one major difference. The number of fish removed at each dam under the Transportation with Spill Scenario was based on an FGE value that was adjusted for spill. For our estimates under the Full Transportation Scenario, we used the FGE values developed during developmental testing of the diversion screens installed in each of the turbine intakes. Using the results from these tests, the FGEs for spring/summer Chinook salmon and sockeye salmon were changed from the values in Table 2 to 60.0, 65.0, 50.0, and 80.0% at Lower Granite, Little Goose, Lower Monumental, and McNary Dams, respectively. Subyearling fall Chinook salmon FGEs were changed from the values in Table 2 to 55.0, 60.0, 40.0, and 65.0% at Lower Granite, Little Goose, Lower Monumental, and McNary Dams, respectively. Steelhead FGEs (in Table 6) were changed from the values in Table 5 to 80.0, 90.0, 65.0, and 90.0% at Lower Granite, Little Goose, Lower Monumental, and McNary Dams, respectively. Using the same formulas as under the Transportation with Spill Scenario, we derived the values found in Tables 3 and 6-10.

Because the adjusted FGE at Lower Granite Dam was changed from 30.3 to 60.0% for yearling spring/summer Chinook and sockeye salmon, the total number of fish collected at Lower Granite Dam will be 7,181,177 (11,968,629 x 0.600) spring/summer Chinook salmon and 100,961 (168,268 x 0.600) *O. nerka* salmon.

Because more PIT-tagged fish will be collected at the upstream dams, the number of PIT-tagged fish that are returned to the river and subsequently collected at McNary Dam will be different under this scenario. The effects of this are shown in Appendices A and B.

As under the Transportation with Spill Scenario, to estimate the number of spring/summer Chinook salmon smolts arriving at McNary Dam, we added the estimated numbers from the Columbia River above McNary (4,952,696) and the Snake River (948,554).

$$4{,}952{,}696 + 948{,}554 = 5{,}901{,}250$$

Tables 7-10 show the changes in percentages of listed fish at each dam.

Table 1. Estimated percentage composition of Snake River spring/summer Chinook salmon arriving at Lower Granite Dam from listed hatcheries compared with total hatchery releases projected for spring 2014.

Hatchery	2014 Total hatchery releases[a]		Survival to Lower Granite Dam	Fish to Lower Granite Dam	
	AD-clipped	Non-AD-clipped	Mean[b]	AD-clipped	Non-AD-clipped
Dworshak[c]	2,318,652	0	0.792	1,836,372	0
Kooskia[c]	580,000	50,000	0.686	397,880	34,300
Lookingglass					
Imnaha[d]	420,000	0	0.657	275,940	0
Grande Ronde[d]	608,089	118,152	0.480	291,883	56,713
Clearwater[c]	1,976,000	0	0.648	1,280,448	0
Rapid River[c]	3,127,000	0	0.739	2,310,853	0
Sawtooth[d]	1,560,500	373,000	0.481	750,601	179,413
McCall[d]	814,000	234,000	0.546	444,444	127,764
Pahsimeroi[d]	834,059	0	0.508	423,702	0
Nez Perce[c]	919,997	1,358,003	0.648	596,158	879,986
Totals					
All stocks	13,391,358	2,371,397		8,759,305	1,412,503
Listed stocks	4,469,709	820,152		2,337,594	425,450
Percent of listed stocks	33.55924%			27.16375%	

a Data from USFWS, NPT, IDFG and ODFW.

b Mean survival estimate made from PIT-tag detections of marked hatchery fish releases as part of the NMFS survival studies (Research Action #1212) from 2009-2013.

c Non-listed stocks in 2014.

d Listed stocks in 2014.

Table 2. Estimate of listed threatened and endangered species arriving at various locations during outmigration year 2014 under past transportation and spill conditions.

Yearling spring/summer Chinook salmon

Snake River ESU

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	FGE[1] Goose	FGE[1] Low Mon**	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild	3,626,495	2,588,257	11.426	1,367,581	0.303	0.331	0.201	0.308	0.900	393,317	121,142	4.68
Listed Hatchery*** AD-clipped	3,626,495	2,588,257	19.531	2,337,594	0.303	0.331	0.201	0.308	0.900	596,227	183,638	7.10
Non-AD-clipped	3,626,495	2,588,257	3.555	425,450	0.303	0.331	0.201	0.308	0.900	262,559	80,868	3.12

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Rocky Reach	Rock Island	Of dam total, % listed fish Wells	Rocky Reach	Rock Island	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	201,638	244,847	530,075	9.6	8.9	11.9	0.308	0.900	390,731	120,345	4.65
Listed Hatchery AD-clipped	443,520	408,482	603,822	21.1	14.9	13.5	0.308	0.900	445,091	137,088	5.30
Non-AD-clipped	199,974	184,176	172,020	9.5	6.7	3.9	0.308	0.900	126,800	39,054	1.51

Fall Chinook salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	FGE[1] Goose	FGE[1] Low Mon	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	977,216	9,480,356	12.802	502,404	0.249	0.317	0.169	0.192	0.75	81,781	15,702	0.17
Listed Subyearling Hatchery AD-clipped	977,216	9,480,356	41.523	1,629,600	0.249	0.317	0.169	0.192	0.75	313,267	60,147	0.63
Non-AD-clipped	977,216	9,480,356	45.675	1,792,560	0.249	0.317	0.169	0.192	0.75	241,758	46,418	0.49
Listed Yearling Hatchery AD-clipped	3,626,495	2,588,257	1.60779	192,431	0.303	0.331	0.201	0.308	0.900	141,444	43,565	1.68
Non-AD-clipped	3,626,495	2,588,257	1.97858	236,809	0.303	0.331	0.201	0.308	0.900	219,684	67,663	2.61

Sockeye salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	FGE[1] Goose	FGE[1] Low Mon	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild and listed hatchery*****	46,442	398,635	95.2	160,272	0.276	0.304	0.260	0.157	0.9	39,211	6,156	1.54

*Note:Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Listed wild and hatchery spring Chinook salmon enter the Snake River above Lower Monumental Dam. WDFW predicts that 27,667 wild and 245,000 listed hatchery (all non-AD-clipped) fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2014 (Michael Gallinat, WDFW, Pers. commun., March 2014)

***Note: Based on 2014 hatchery releases, it was estimated that 26.68698% and 30.12029% of the AD-clipped and non-AD-clipped, respectively, hatchery fish arriving at Lower Granite Dam are products of a listed hatchery (Table 1). Because Table 2 is based on the total collection at Lower Granite Dam, which includes both wild and hatchery (listed and unlisted) fish, these estimates of 26.68698% and 30.12029% of all hatchery fish were adjusted to 19.53101% and 3.55471% of the total collection at Lower Granite Dam.

****Note: Estimated values based on the average redd counts from 2006-2011 (Streamnet) and the 2013 adult returns (FPC Weekly Reports).

*****Note: The Lower Granite Dam estimate is based on IDFG's estimate of 21,929 wild sockeye salmon smolts and 138,343 hatchery fish that overwintered in the lakes arriving at Lower Granite Dam in 2014 (Mike Peterson, IDFG, Pers. commun., April 2014). The McNary Dam estimate is the average collection count at McNary Dam from 1992-2013 (Annual Fish Passage Center Reports).

1 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted from 2009-2013 (Steven G. Smith, NMFS, Pers. commun., April 2014).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))\text{x}(\text{Of Granite Total \% Listed Fish})$

b) Listed Fish to McNary = $(\text{Listed Fish to Granite})\text{x}(1-\text{FGE}_{\text{Granite}})\text{x}(\text{Project Survival})\text{x}(1-\text{FGE}_{\text{Goose}})\text{x}(\text{Project Survival})\text{x}(1-\text{FGE}_{\text{Low Mon}})\text{x}(\text{Project Survival})^2 +$
$(\text{listed Tucannon fish})\text{x}(1-\text{FGE}_{\text{Low Mon}})\text{x}(\text{Project Survival})^2 + (\text{PIT-tagged fish})$

where: listed Tucannon fish = 27,667 wild and 245,000 hatchery (all non-AD-clipped)
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table A1.

Table 3. Estimate of listed threatened and endangered species arriving at various locations during outmigration year 2014 under full transportation conditions (no spill).

Yearling spring/summer Chinook salmon

Snake River ESU

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	FGE Goose	FGE Low Mon**	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild	7,181,177	4,721,000	11.426	1,367,581	0.60	0.65	0.50	0.80	0.900	136,553	109,242	2.31
Listed Hatchery*** AD-clipped	7,181,177	4,721,000	19.531	2,337,594	0.60	0.65	0.50	0.80	0.900	142,015	113,612	2.41
Non-AD-clipped	7,181,177	4,721,000	3.555	425,450	0.60	0.65	0.50	0.80	0.900	118,765	95,012	2.01

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Number of listed fish passing dam Rocky Reach	Number of listed fish passing dam Rock Island	Of dam total, % listed fish Wells	Of dam total, % listed fish Rocky Reach	Of dam total, % listed fish Rock Island	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	201,638	244,847	530,075	9.6	8.9	11.9	0.80	0.900	390,731	312,585	6.62
Listed Hatchery AD-clipped	443,520	408,482	603,822	21.1	14.9	13.5	0.80	0.900	445,091	356,073	7.54
Non-AD-clipped	199,974	184,176	172,020	9.5	6.7	3.9	0.80	0.900	126,800	101,440	2.15

Subyearling fall Chinook salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	FGE Goose	FGE Low Mon	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild****	2,158,510	32,089,853	12.802	502,404	0.55	0.60	0.40	0.65	0.75	27,293	17,740	0.06
Listed Subyearling Hatchery AD-clipped	2,158,510	32,089,853	41.523	1,629,600	0.55	0.60	0.40	0.65	0.75	123,186	80,071	0.25
Non-AD-clipped	2,158,510	32,089,853	45.675	1,792,560	0.55	0.60	0.40	0.65	0.75	61,255	39,816	0.12
Listed Yearling Hatchery AD-clipped	7,181,177	4,721,000	1.60779	192,431	0.60	0.65	0.50	0.80	0.900	67,915	54,332	1.15
Non-AD-clipped	7,181,177	4,721,000	1.97858	236,809	0.60	0.65	0.50	0.80	0.900	112,126	89,701	1.90

Sockeye salmon

Rearing type	Total Collection* Granite	Total Collection* McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	FGE Goose	FGE Low Mon	FGE McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	Of Fish Collected at McNary % Listed Fish
Wild and listed hatchery*****	100,961	398,635	95.2	160,272	0.60	0.65	0.50	0.80	0.900	7,361	5,889	1.48

*Note: Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Listed wild and hatchery spring Chinook salmon enter the Snake River above Lower Monumental Dam. WDFW predicts that 27,667 wild and 245,000 listed hatchery (all non-AD-clipped) fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2014 (Michael Gallinat, WDFW, Pers. commun., March 2014)

***Note: Based on 2014 hatchery releases, it was estimated that 26.68698% and 30.12029% of the AD-clipped and non-AD-clipped, respectively, hatchery fish arriving at Lower Granite Dam are products of a listed hatchery (Table 1). Because Table 2 is based on the total collection at Lower Granite Dam, which includes both wild and hatchery (listed and unlisted) fish, these estimates of 26.68698% and 30.12029% of all hatchery fish were adjusted to 19.53101% and 3.55471% of the total collection at Lower Granite Dam.

****Note: Estimated values based on the average redd counts from 2006-2011 (Streamnet) and the 2013 adult returns (FPC Weekly Reports).

*****Note: The Lower Granite Dam estimate is based on IDFG's estimate of 21,929 wild sockeye salmon smolts and 138,343 hatchery fish that overwintered in the lakes arriving at Lower Granite Dam in 2014 (Mike Peterson, IDFG, Pers. commun., April 2014). The McNary Dam estimate is the average collection count at McNary Dam from 1992-2013 (Annual Fish Passage Center Reports).

1 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted from 2009-2013 (Steven G. Smith, NMFS, Pers. commun., April 2014).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))\text{x}(\text{Of Granite Total \% Listed Fish})$

b) Listed Fish to McNary = $(\text{Listed Fish to Granite})\text{x}(1-\text{FGE}_{\text{Granite}})\text{x}(\text{Project Survival})\text{x}(1-\text{FGE}_{\text{Goose}})\text{x}(\text{Project Survival})\text{x}(1-\text{FGE}_{\text{Low Mon}})\text{x}(\text{Project Survival})^2 +$
$(\text{listed Tucannon fish})\text{x}(1-\text{FGE}_{\text{Low Mon}})\text{x}(\text{Project Survival})^2 + (\text{PIT-tagged fish})$

where: listed Tucannon fish = 27,667 wild and 245,000 hatchery (all non-AD-clipped)
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table A1.

Table 4. Estimated percentage composition of Snake River steelhead arriving at Lower Granite Dam from total hatchery releases projected for spring 2014.

Hatchery	2014 Total hatchery releases[a]		Survival to Lower Granite Dam	Fish to Lower Granite Dam	
	AD-clipped	Non-AD-clipped	Mean[b]	AD-clipped	Non-AD-clipped
Dworshak[c]	1,979,000	240,000	0.77	1,523,830	184,800
Clearwater[c]	479,875	345,125	0.792	380,061	273,339
Hagerman[c,d]	1,404,000	61,500	0.776	1,089,504	47,724
Magic Valley[c,d]	1,180,798	386,833	0.801	945,819	309,853
Niagara Springs[d]	1,800,000	0	0.793	1,427,400	0
Irrigon (released above Lower Granite Dam)[c,d]	1,015,000	0	0.777	788,655	0
Lyons Ferry (released into Grande Ronde)[d]	210,000	0	0.79	165,900	0
Totals					
All stocks	8,068,673	1,033,458		6,321,169	815,716
Listed stocks	3,033,875	406,625		2,350,666	321,063
Percent of listed stocks	37.79884%			37.43551%	

a Data from USFWS, IDFG, ODFW, and WDFW.

b Mean survival estimate made from PIT-tag detections of marked hatchery fish releases as part of the NMFS survival studies (Research Action #1212) from 2009-2013.

c Listed stocks in 2014.

d Un-listed stocks in 2014.

Table 5. Estimates of listed threatened and endangered steelhead arriving at various locations during outmigration year 2014 under past transportation and spill conditions.

Snake River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild	2,659,444	516,083	11.4412	922,036	0.330	0.38	0.259	0.177	0.9	211,968	37,518	7.27
Listed Hatchery*** AD-clipped	2,659,444	516,083	29.1685	2,350,666	0.330	0.38	0.259	0.177	0.9	523,338	92,631	17.95
Non-AD-clipped	2,659,444	516,083	3.9839	321,063	0.330	0.38	0.259	0.177	0.9	94,851	16,789	3.25

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Rocky Reach	Rock Island	Of dam total, % listed fish Wells	Rocky Reach	Rock Island	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild***	75,615	92,512	108,650	13.2	16.2	15.9	0.177	0.9	77,630	13,741	2.66
Listed Hatchery*** AD-clipped	499,184	478,218	575,199	79.9	77.3	69.2	0.177	0.9	410,976	72,743	14.10
Non-AD-clipped	50,017	47,917	147,216	8.0	7.7	17.7	0.177	0.9	153,315	27,137	5.26

Mid-Columbia River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Summer-run(First dam reached is McNary Dam) Wild								0.177	0.9	115,301	20,408	3.95
Listed Hatchery*** AD-clipped								0.177	0.9	0	0	0.00
Non-AD-clipped								0.177	0.9	50,000	8,850	1.71
Winter-run(First dam reached is Bonneville Dam) Wild								0.177	0.9	0	0	0.00
Listed Hatchery*** AD-clipped								0.177	0.9	0	0	0.00
Non-AD-clipped								0.177	0.9	0	0	0.00

*Note: Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Hatchery steelhead and listed wild steelhead enter the Snake River above Lower Monumental Dam. WDFW predicts that 21,143 wild fish and 50,000 (all non-AD-clipped) listed hatchery fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2014. An additional 50,000 (all non-AD-clipped) listed Mid-Columbia hatchery summer steelhead will outmigrate from the Touchet and Walla Walla Rivers above McNary Dam Michael Gillanat, WDFW, Pers. commun., March 2014).

***Note: Estimated values based on 2013 collection numbers and on the number of adult returns from 2009-2013 (Fish Passage Center Weekly Reports).

1 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted from 2009-2013 (Steven G. Smith, NMFS, Pers. commun., April 2014).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))$x(Of Granite Total % Listed Fish)

b) Listed Fish to McNary = (Listed Fish to Granite)x$(1-\text{FGE}_{\text{Granite}})$x(Project Survival)x$(1-\text{FGE}_{\text{Goose}})$x(Project Survival)x$(1-\text{FGE}_{\text{Low Mon}})x(\text{Project Survival})^2$ + (listed Tucannon fish)x$(1-\text{FGE}_{\text{Low Mon}})x(\text{Project Survival})^2$ +(Rock Island listed fish)x$(\text{Project Survival})^2$ + (PIT-tagged fish)

where: listed Tucannon fish = 21,143 wild and 50,000 (all Non-AD-clipped) hatchery fish
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table B1.

Table 6. Estimates of listed threatened and endangered steelhead arriving at various locations during outmigration year 2014 under full transportation conditions (no spill).

Snake River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild	6,447,137	1,162,720	11.4412	922,036	0.80	0.90	0.65	0.90	0.90	30,874	27,787	2.39
Listed Hatchery*** AD-clipped	6,447,137	1,162,720	29.1685	2,350,666	0.80	0.90	0.65	0.90	0.90	62,451	56,206	4.83
Non-AD-clipped	6,447,137	1,162,720	3.9839	321,063	0.80	0.90	0.65	0.90	0.90	15,650	14,085	1.21

Upper Columbia River ESU

Rearing type	Number of listed fish passing dam Wells	Rocky Reach	Rock Island	Of dam total, % listed fish Wells	Rocky Reach	Rock Island	FGE[1] McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Wild***	75,615	92,512	108,650	13.2	16.2	15.9	0.90	0.90	77,630	69,867	6.01
Listed Hatchery*** AD-clipped	499,184	478,218	575,199	79.9	77.3	69.2	0.90	0.90	410,976	369,878	31.81
Non-AD-clipped	50,017	47,917	147,216	8.0	7.7	17.7	0.90	0.90	153,315	137,984	11.87

Mid-Columbia River ESU

Rearing type	Total Collection* Granite	McNary	Of Granite Total % Listed Fish	Listed Fish to Granite[a]	FGE[1] Granite	Goose	Low Mon**	McNary	Project Survival	Listed fish to McNary[b]	Of Fish Collected at McNary Listed Fish	% Listed Fish
Summer-run(First dam reached is McNary Dam)												
Wild								0.90	0.90	115,301	103,771	8.92
Listed Hatchery*** AD-clipped								0.90	0.90	0	0	0.00
Non-AD-clipped								0.90	0.90	50,000	45,000	3.87
Winter-run(First dam reached is Bonneville Dam)												
Wild								0.90	0.90	0	0	0.00
Listed Hatchery*** AD-clipped								0.90	0.90	0	0	0.00
Non-AD-clipped								0.90	0.90	0	0	0.00

*Note: Total Collection is the total number of fish collected of that species or run, regardless of rearing type.

**Note: Hatchery steelhead and listed wild steelhead enter the Snake River above Lower Monumental Dam. WDFW predicts that 21,143 wild fish and 50,000 (all non-AD-clipped) listed hatchery fish will outmigrate from the Tucannon River and Lyons Ferry Fish Hatchery in 2014. An additional 50,000 (all non-AD-clipped) listed Mid-Columbia hatchery summer steelhead will outmigrate from the Touchet and Walla Walla Rivers above McNary Dam Michael Gillanat, WDFW, Pers. commun., March 2014).

***Note: Estimated values based on 2013 collection numbers and on the number of adult returns from 2009-2013 (Fish Passage Center Weekly Reports).

2 The FGE used in this table is adjusted for spill conditions, and PIT-tag detection efficiency at a dam. This estimate was obtained from the NMFS survival studies conducted from 2009-2013 (Steven G. Smith, NMFS, Pers. commun., April 2014).

Formulas:

a) Listed fish to Granite = $((\text{Collection}_{\text{Granite}})/(\text{FGE}_{\text{Granite}}))\text{x}(\text{Of Granite Total \% Listed Fish})$

b) Listed Fish to McNary = $(\text{Listed Fish to Granite})\text{x}(1-\text{FGE}_{\text{Granite}})\text{x}(\text{Project Survival})\text{x}(1-\text{FGE}_{\text{Goose}})\text{x}(\text{Project Survival})\text{x}(1-\text{FGE}_{\text{Low Mon}})\text{x}(\text{Project Survival})^2 +$
$(\text{listed Tucannon fish})\text{x}(1-\text{FGE}_{\text{Low Mon}})\text{x}(\text{Project Survival})^2 + (\text{Rock Island listed fish})\text{x}(\text{Project Survival})^2 + (\text{PIT-tagged fish})$

where: listed Tucannon fish = 21,143 wild and 50,000 (all Non-AD-clipped) hatchery fish
PIT-tagged fish = fish collected at Snake River dams, returned to the river, and subsequently arrived at McNary Dam; See Appendix Table B1.

Table 7a. Estimated juvenile Chinook salmon collection at each of eight mainstem collection facilities in 2014 under a full transportation scenario.

	Full Transportation Scenario Chinook salmon							
	Yearlings					Subyearlings		
Total fish collected at:*								
Lower Granite	7,181,177					2,158,510		
Little Goose	2,879,173					794,724		
Lower Monumental	1,089,153					250,945		
Ice Harbor**	632,371					127,041		
Columbia River								
Wells***	2,098,076					NA		
Rocky Reach***	2,750,202					NA		
Rock Island***	4,470,456					NA		
Wanapum***	4,045,763					NA		
Priest Rapids***	3,661,416					NA		
McNary****	4,721,000					32,089,853		
John Day** ****	3,995,435					4,745,777		
The Dalles** ****	2,803,120					2,542,381		
Bonneville (I & II combined)** *****	3,624,375					8,859,617		
---To the tailrace of Bonneville	9,060,938					29,532,057		
---To Tongue Point*****	35,477,365					103,971,937		
	Spring/Summer Chinook			Fall Chinook - Yearlings		Fall Chinook - Subyearlings		
		Hatchery		Hatchery			Hatchery	
Total listed fish at:	Wild	Ad-clip	No Ad-clip	Ad-clip	No Ad-clip	Wild	Ad-clip	No Ad-clip
Lower Granite	820,549	1,402,556	255,270	115,458	142,085	276,323	896,280	985,908
Little Goose	350,406	569,056	99,555	45,028	55,413	101,737	329,994	362,993
Lower Monumental	126,254	153,131	146,623	83,846	138,427	32,347	145,999	72,599
Ice Harbor**	91,036	94,677	79,176	45,277	74,751	16,376	73,912	36,753
Columbia River								
Wells***	201,638	443,520	199,974	0	0	NA	NA	NA
Rocky Reach***	244,847	408,482	184,176	0	0	NA	NA	NA
Rock Island***	530,075	603,822	172,020	0	0	NA	NA	NA
Wanapum***	479,718	546,459	155,678	0	0	NA	NA	NA
Priest Rapids***	434,145	494,545	140,889	0	0	NA	NA	NA
McNary****	421,827	469,685	196,451	122,554	202,334	17,740	80,071	39,816
John Day** ****	284,733	317,037	132,604	82,724	136,575	2,507	11,318	5,628
The Dalles** ****	170,840	190,222	87,362	49,634	81,945	1,343	6,063	3,015
Bonneville (I & II combined)** *****	154,591	171,200	78,626	44,671	73,751	153,180	3,110,092	124,081
---To the tailrace of Bonneville	386,478	428,000	196,565	111,678	184,378	510,600	10,366,973	413,603
---To Tongue Point*****	5,224,731	11,762,301	1,089,638	356,010	520,303	11,273,209	35,969,241	2,174,269
Percent listed fish at:								
Lower Granite	11.43%	19.53%	3.55%	1.61%	1.98%	12.80%	41.52%	45.68%
Little Goose	12.17%	19.76%	3.46%	1.56%	1.92%	12.80%	41.52%	45.68%
Lower Monumental	11.59%	14.06%	13.46%	7.70%	12.71%	12.89%	58.18%	28.93%
Ice Harbor**	14.40%	14.97%	12.52%	7.16%	11.82%	12.89%	58.18%	28.93%
Columbia River								
Wells***	9.61%	21.14%	9.53%	0.00%	0.00%	NA	NA	NA
Rocky Reach***	8.90%	14.85%	6.70%	0.00%	0.00%	NA	NA	NA
Rock Island***	11.86%	13.51%	3.85%	0.00%	0.00%	NA	NA	NA
Wanapum***	11.86%	13.51%	3.85%	0.00%	0.00%	NA	NA	NA
Priest Rapids***	11.86%	13.51%	3.85%	0.00%	0.00%	NA	NA	NA
McNary****	8.94%	9.95%	4.16%	2.60%	4.29%	0.06%	0.25%	0.12%
John Day** ****	7.13%	7.93%	3.32%	2.07%	3.42%	0.05%	0.24%	0.12%
The Dalles** ****	6.09%	6.79%	3.12%	1.77%	2.92%	0.05%	0.24%	0.12%
Bonneville (I & II combined)** *****	4.27%	4.72%	2.17%	1.23%	2.03%	1.73%	35.10%	1.40%
---To the tailrace of Bonneville	4.27%	4.72%	2.17%	1.23%	2.03%	1.73%	35.10%	1.40%
---To Tongue Point*****	14.73%	33.15%	3.07%	1.00%	1.47%	10.84%	34.60%	2.09%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.
**** Note: (See next page)
***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Full Transportation scenario (above), 14.73% of them will be listed wild fish, or 147 fish. To these 147 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 147 x 0.2549 = 37; UCR, 147 x 0.0545 = 8; etc).

Yearling	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	25.90	21.68	33.20
SR - Fall (Yrlg)	0.00	10.37	31.35
UCR	74.10	67.95	35.45
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note: Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam

Yearling	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	25.76	21.68	33.20
SR - Fall (Yrlg)	0.00	10.37	31.35
UCR	73.70	67.95	35.45
LCR - Spring	0.54	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	0.79	0.18	2.19
LCR - Tule fall	99.21	99.82	97.81
LCR - Late run fall	0.00	0.00	0.00

Tongue Point

Yearling	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	25.49	18.13	39.47
SR - Fall (Yrlg)	0.00	2.44	28.04
UCR	5.45	2.69	6.20
LCR - Spring	32.37	30.83	23.57
UWR	36.69	45.91	2.72
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	3.83	4.09	67.63
LCR - Tule fall	71.33	95.91	32.37
LCR - Late run fall	24.84	0.00	0.00

SR - Spr/Sum = Snake River ESU - Spring/Summer Chinook salmon
SR - Fall (Yrlg) = Snake River ESU - Yearling Fall Chinook salmon
SR - Fall (Subyrlg) = Snake River ESU - Subyearling Fall Chinook salmon
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook salmon
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 7b. Estimated juvenile Chinook salmon collection at each of eight mainstem collection facilities in 2014 under a transportaion with spill scenario.

	Transportation with Spill Scenario Chinook salmon							
	Yearlings					Subyearlings		
Total fish collected at:*								
Lower Granite	3,626,495					977,216		
Little Goose	2,505,313					700,732		
Lower Monumental	1,062,744					230,234		
Ice Harbor**	1,019,886					206,325		
Columbia River								
Wells***	2,098,076					NA		
Rocky Reach***	2,750,202					NA		
Rock Island***	4,470,456					NA		
Wanapum***	4,045,763					NA		
Priest Rapids***	3,661,416					NA		
McNary****	2,588,257					9,480,356		
John Day** ****	1,229,721					3,235,372		
The Dalles** ****	3,613,827					5,722,946		
Bonneville (I & II combined)** *****	2,046,385					664,254		
---To the tailrace of Bonneville	10,885,027					39,073,765		
---To Tongue Point*****	33,461,346					89,608,151		
	Spring/Summer Hatchery			Fall Chinook - Yearlings Hatchery		Fall Chinook - Subyearlings Hatchery		
Total listed fish at:	Wild	Ad-clip	No Ad-clip	Ad-clip	No Ad-clip	Wild	Ad-clip	No Ad-clip
Lower Granite	414,377	708,291	128,911	58,306	71,753	125,099	405,770	446,347
Little Goose	291,775	491,041	88,339	39,955	49,170	89,705	290,965	320,062
Lower Monumental	117,874	182,789	81,544	43,928	68,228	29,568	113,260	87,406
Ice Harbor**	116,248	176,219	77,601	41,804	64,929	26,497	101,498	78,329
Columbia River								
Wells***	201,638	443,520	199,974	0	0	NA	NA	NA
Rocky Reach***	244,847	408,482	184,176	0	0	NA	NA	NA
Rock Island***	530,075	603,822	172,020	0	0	NA	NA	NA
Wanapum***	479,718	546,459	155,678	0	0	NA	NA	NA
Priest Rapids***	434,145	494,545	140,889	0	0	NA	NA	NA
McNary****	241,487	320,726	119,922	43,565	67,663	15,702	60,147	46,417
John Day** ****	97,379	129,332	48,358	17,568	27,285	5,253	20,123	15,529
The Dalles** ****	254,032	337,388	133,951	45,830	71,178	9,292	35,595	27,469
Bonneville (I & II combined)** *****	107,848	142,715	56,661	19,386	30,108	9,086	177,745	8,278
---To the tailrace of Bonneville	573,660	759,122	301,388	103,117	160,149	534,471	10,455,588	486,941
---To Tongue Point*****	4,987,695	11,382,452	991,807	245,306	349,300	11,129,007	35,475,654	1,686,523
Percent listed fish at:								
Lower Granite	11.43%	19.53%	3.55%	1.61%	1.98%	12.80%	41.52%	45.68%
Little Goose	11.65%	19.60%	3.53%	1.59%	1.96%	12.80%	41.52%	45.68%
Lower Monumental	11.09%	17.20%	7.67%	4.13%	6.42%	12.84%	49.19%	37.96%
Ice Harbor**	11.40%	17.28%	7.61%	4.10%	6.37%	12.84%	49.19%	37.96%
Columbia River								
Wells***	9.61%	21.14%	9.53%	0.00%	0.00%	NA	NA	NA
Rocky Reach***	8.90%	14.85%	6.70%	0.00%	0.00%	NA	NA	NA
Rock Island***	11.86%	13.51%	3.85%	0.00%	0.00%	NA	NA	NA
Wanapum***	11.86%	13.51%	3.85%	0.00%	0.00%	NA	NA	NA
Priest Rapids***	11.86%	13.51%	3.85%	0.00%	0.00%	NA	NA	NA
McNary****	9.33%	12.39%	4.63%	1.68%	2.61%	0.17%	0.63%	0.49%
John Day** ****	7.92%	10.52%	3.93%	1.43%	2.22%	0.16%	0.62%	0.48%
The Dalles** ****	7.03%	9.34%	3.71%	1.27%	1.97%	0.16%	0.62%	0.48%
Bonneville (I & II combined)** *****	5.27%	6.97%	2.77%	0.95%	1.47%	1.37%	26.76%	1.25%
---To the tailrace of Bonneville	5.27%	6.97%	2.77%	0.95%	1.47%	1.37%	26.76%	1.25%
---To Tongue Point*****	14.91%	34.02%	2.96%	0.73%	1.04%	12.42%	39.59%	1.88%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.
**** Note: (See next page)
***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Transportation with spill scenario (above), 14.91% of them will be listed wild fish, or 149 fish. To these 149 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 149 x 0.2194 = 33; UCR, 149 x 0.0571 =9; etc).

Yearling	**Transportation with spill**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	50.16	50.41	43.11
SR - Fall (Yrlg)	0.00	11.96	36.07
UCR	49.84	37.63	20.82
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note: Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam

Yearling	**Transportation with spill**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	49.98	50.41	43.11
SR - Fall (Yrlg)	0.00	11.96	36.07
UCR	49.65	37.63	20.82
LCR - Spring	0.37	0.00	0.00
UWR	0.00	0.00	0.00
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	5.22	1.02	16.92
LCR - Tule fall	94.78	98.98	83.08
LCR - Late run fall	0.00	0.00	0.00

Tongue Point

Yearling	**Transportation with spill**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR - Spr/Sum	21.94	15.53	37.04
SR - Fall (Yrlg)	0.00	2.11	26.39
UCR	5.71	2.79	6.98
LCR - Spring	33.91	31.97	26.53
UWR	38.44	47.60	3.06
Subyearling			
Chinook salmon			
SR - Fall (Subyrlg)	2.59	2.75	58.26
LCR - Tule fall	72.25	97.25	41.74
LCR - Late run fall	25.16	0.00	0.00

SR - Spr/Sum = Snake River ESU - Spring/Summer Chinook salmon
SR - Fall (Yrlg) = Snake River ESU - Yearling Fall Chinook salmon
SR - Fall (Subyrlg) = Snake River ESU - Subyearling Fall Chinook salmon
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 7c. Estimated juvenile sockeye, coho, and chum salmon collection at each of eight mainstem collection facilities in 2014.

	Full Transportation Scenario					Transportation with Spill Scenario				
	Sockeye salmon	Coho salmon			Chum salmon	Sockeye salmon	Coho salmon			Chum salmon
Total fish collected at:*										
Lower Granite	100,961	313,916			0	46,442	158,527			0
Little Goose	39,375	122,427			0	33,332	108,634			0
Lower Monumental	9,541	29,665			0	17,857	39,719			0
Ice Harbor**	5,152	16,019			0	12,899	37,798			0
Columbia River										
Wells***	NA	221,267			0	NA	221,267			0
Rocky Reach***	NA	199,140			0	NA	199,140			0
Rock Island***	NA	1,207,351			0	NA	1,207,351			0
Wanapum***	NA	1,086,616			0	NA	1,086,616			0
Priest Rapids***	NA	977,954			0	NA	977,954			0
McNary****	398,635	1,235,210			0	398,635	507,544			0
John Day** ****	1,371,101	1,439,424			0	73,125	343,967			0
The Dalles** ****	822,661	863,654			0	822,656	897,305			0
Bonneville (I & II combined)** *****	740,395	2,401,887			12,000	347,983	1,143,121			12,000
---To the tailrace of Bonneville	1,850,988	6,004,718			30,000	1,850,973	6,080,431			30,000
---To Tongue Point*****	2,000,865	17,287,484			1,617,982	1,948,604	15,592,184			1,617,982
		Coho salmon					Coho salmon			
	Sockeye		Hatchery		Chum	Sockeye		Hatchery		Chum
Total listed fish at:	salmon	Wild	Ad-clip	No Ad-clip	salmon	salmon	Wild	Ad-clip	No Ad-clip	salmon
Lower Granite	96,163	0	0	0	0	44,235	0	0	0	0
Little Goose	37,504	0	0	0	0	31,748	0	0	0	0
Lower Monumental	9,088	0	0	0	0	17,009	0	0	0	0
Ice Harbor**	4,908	0	0	0	0	12,287	0	0	0	0
Columbia River										
Wells***	NA	0	0	0	0	NA	0	0	0	0
Rocky Reach***	NA	0	0	0	0	NA	0	0	0	0
Rock Island***	NA	0	0	0	0	NA	0	0	0	0
Wanapum***	NA	0	0	0	0	NA	0	0	0	0
Priest Rapids***	NA	0	0	0	0	NA	0	0	0	0
McNary****	5,889	0	0	0	0	6,156	0	0	0	0
John Day** ****	3,975	0	0	0	0	1,129	0	0	0	0
The Dalles** ****	2,385	0	0	0	0	12,701	0	0	0	0
Bonneville (I & II combined)** *****	2,147	38,198	0	0	12,000	5,373	17,953	0	0	12,000
---To the tailrace of Bonneville	5,368	95,495	0	0	30,000	28,580	95,495	0	0	30,000
---To Tongue Point*****	154,012	1,162,883	8,137,485	380,945	1,617,982	121,572	1,162,883	8,137,485	380,945	1,617,982
Percent listed fish at:										
Lower Granite	95.25%	0.00%	0.00%	0.00%	----	95.25%	0.00%	0.00%	0.00%	----
Little Goose	95.25%	0.00%	0.00%	0.00%	----	95.25%	0.00%	0.00%	0.00%	----
Lower Monumental	95.25%	0.00%	0.00%	0.00%	----	95.25%	0.00%	0.00%	0.00%	----
Ice Harbor**	95.26%	0.00%	0.00%	0.00%	----	95.26%	0.00%	0.00%	0.00%	----
Columbia River		0.00%	0.00%	0.00%			0.00%	0.00%	0.00%	
Wells***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Rocky Reach***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Rock Island***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Wanapum***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
Priest Rapids***	NA	0.00%	0.00%	0.00%	----	NA	0.00%	0.00%	0.00%	----
McNary****	1.48%	0.00%	0.00%	0.00%	----	1.54%	0.00%	0.00%	0.00%	----
John Day** ****	0.29%	0.00%	0.00%	0.00%	----	1.54%	0.00%	0.00%	0.00%	----
The Dalles** ****	0.29%	0.00%	0.00%	0.00%	----	1.54%	0.00%	0.00%	0.00%	----
Bonneville (I & II combined)** *****	0.29%	1.59%	0.00%	0.00%	----	1.54%	1.57%	0.00%	0.00%	----
---To the tailrace of Bonneville	0.29%	1.59%	0.00%	0.00%	100.00%	1.54%	1.57%	0.00%	0.00%	100.00%
---To Tongue Point*****	7.70%	6.73%	47.07%	2.20%	100.00%	6.24%	7.46%	52.19%	2.44%	100.00%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.

Table 8a. Estimated juvenile salmon collection at each of the mainstem collection facilities in 2014 under a full transportation scenario. Percentage of listed fish at each facility.

****Use this table only if the reartype and/or clip/no-clip status of all handled fish is known****

	Full Transportation Scenario									
	Yearling Chinook salmon					Coho salmon			Subyearling Chinook salmon	
	Unclipped			Clipped		Unclipped		Clipped	Unclipped	Clipped
Total fish collected at:*										
Lower Granite	1,810,136			5,371,042		313,916		0	1,262,230	896,280
Little Goose	736,345			2,142,828		102,023		0	464,730	329,994
Lower Monumental	467,270			621,882		20,601		0	104,946	145,999
Ice Harbor**	275,184			357,186		9,270		0	53,129	73,912
Columbia River										
Wells***	401,612			1,696,464		221,267		0	NA	NA
Rocky Reach***	429,023			2,321,179		199,140		0	NA	NA
Rock Island***	702,095			3,768,361		1,207,351		0	NA	NA
Wanapum***	631,886			3,391,525		1,086,616		0	NA	NA
Priest Rapids***	568,697			3,052,373		977,955		0	NA	NA
McNary****	1,389,767			3,302,183		974,651		248,010	24,500,772	7,589,081
John Day** ****	1,318,434			2,657,392		730,045		700,908	3,463,090	1,282,687
The Dalles** ****	816,388			1,974,966		438,027		420,545	1,855,227	687,154
Bonneville (I & II combined)** *****	735,585			2,878,201		648,423		1,748,891	2,645,741	6,213,876
---To the tailrace of Bonneville	1,838,963			7,195,503		1,621,058		4,372,228	8,819,137	20,712,920
---To Tongue Point*****	8,237,723			29,885,566		3,931,424		14,918,766	48,986,629	54,985,308

	Spring/Summer Chinook		Fall Chinook	Spring/Summer Chinook	Fall Chinook	Coho salmon		Coho salmon	Fall Chinook		Fall Chinook
		Hatchery	Hatchery	Hatchery	Hatchery		Hatchery	Hatchery		Hatchery	Hatchery
Total listed fish at:	Wild	No Ad-clip	No Ad-clip	Ad-clip	Ad-clip	Wild	No Ad-clip	Ad-clip	Wild	No Ad-clip	Ad-clip
Lower Granite	820,549	255,270	142,085	1,402,556	115,458	0	0	0	276,323	985,908	896,280
Little Goose	350,406	99,555	55,413	569,056	45,028	0	0	0	101,737	362,993	329,994
Lower Monumental	126,254	146,623	138,427	153,131	83,846	0	0	0	32,347	72,599	145,999
Ice Harbor**	91,036	79,176	74,751	94,677	45,277	0	0	0	16,376	36,753	73,912
Columbia River											
Wells***	201,638	199,974	0	443,520	0	0	0	0	NA	NA	NA
Rocky Reach***	244,847	184,176	0	408,482	0	0	0	0	NA	NA	NA
Rock Island***	530,075	172,020	0	603,822	0	0	0	0	NA	NA	NA
Wanapum***	479,718	155,678	0	546,459	0	0	0	0	NA	NA	NA
Priest Rapids***	434,145	140,889	0	494,545	0	0	0	0	NA	NA	NA
McNary****	421,827	196,451	202,334	469,685	122,554	0	0	0	17,740	39,816	80,071
John Day** ****	284,733	132,604	136,575	317,037	82,724	0	0	0	2,507	5,628	11,318
The Dalles** ****	170,840	87,362	81,945	190,222	49,634	0	0	0	1,343	3,015	6,063
Bonneville (I & II combined)** *****	154,591	78,626	73,751	171,200	44,671	38,198	0	0	153,180	124,081	3,110,092
---To the tailrace of Bonneville	386,478	196,565	184,378	428,000	111,678	95,495	0	0	510,600	413,603	10,366,973
---To Tongue Point*****	5,224,731	1,089,638	520,303	11,762,301	356,010	1,162,883	380,945	8,137,485	11,273,209	2,174,269	35,969,241
Percent listed fish at:											
Lower Granite	45.33%	14.10%	7.85%	26.113%	2.150%	0.00%	0.00%	0.00%	21.89%	78.11%	100.00%
Little Goose	47.59%	13.52%	7.53%	26.556%	2.101%	0.00%	0.00%	0.00%	21.89%	78.11%	100.00%
Lower Monumental	27.02%	31.38%	29.62%	24.624%	13.483%	0.00%	0.00%	0.00%	30.82%	69.18%	100.00%
Ice Harbor**	33.08%	28.77%	27.16%	26.506%	12.676%	0.00%	0.00%	0.00%	30.82%	69.18%	100.00%
Columbia River											
Wells***	50.21%	49.79%	0.00%	26.14%	0.00%	NA	NA	NA	NA	NA	NA
Rocky Reach***	57.07%	42.93%	0.00%	17.60%	0.00%	NA	NA	NA	NA	NA	NA
Rock Island***	75.50%	24.50%	0.00%	16.02%	0.00%	NA	NA	NA	NA	NA	NA
Wanapum***	75.92%	24.64%	0.00%	16.11%	0.00%	NA	NA	NA	NA	NA	NA
Priest Rapids***	76.34%	24.77%	0.00%	16.20%	0.00%	NA	NA	NA	NA	NA	NA
McNary****	30.35%	14.14%	14.56%	14.22%	3.71%	0.00%	0.00%	0.00%	0.07%	0.16%	1.06%
John Day** ****	21.60%	10.06%	10.36%	11.93%	3.11%	0.00%	0.00%	0.00%	0.07%	0.16%	0.88%
The Dalles** ****	20.93%	10.70%	10.04%	9.63%	2.51%	0.00%	0.00%	0.00%	0.07%	0.16%	0.88%
Bonneville (I & II combined)** *****	21.02%	10.69%	10.03%	5.95%	1.55%	5.89%	0.00%	0.00%	5.79%	4.69%	50.05%
---To the tailrace of Bonneville	21.02%	10.69%	10.03%	5.95%	1.55%	5.89%	0.00%	0.00%	5.79%	4.69%	50.05%
---To Tongue Point*****	63.42%	13.23%	6.32%	39.36%	1.19%	29.58%	9.69%	54.55%	23.01%	4.44%	65.42%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.
** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.
*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.
**** Note: (See next page)
***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Full Transportation scenario (above),
63.42% of them will be listed wild fish, or 634 fish. To these 634 fish, apply the percentages
listed below under the Tongue Point section to determine how many are from each ESU
(SR,634 x 0.2549 = 162; UCR, 634 x 0.0545 = 35; etc).

Spring/Summer	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR	25.90	21.68	33.20
SR - Fall (Yrlg)	0.00	10.37	31.35
UCR	74.10	67.95	35.45
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Fall			
Chinook salmon			
SR	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note:
Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam			
Spring/Summer	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR	25.76	21.68	33.20
SR - Fall (Yrlg)	0.00	10.37	31.35
UCR	73.70	67.95	35.45
LCR - Spring	0.54	0.00	0.00
UWR	0.00	0.00	0.00
Fall			
Chinook salmon			
SR	0.79	0.18	2.19
LCR - Tule fall	99.21	99.82	97.81
LCR - Late run fall	0.00	0.00	0.00

Tongue Point			
Spring/Summer	**Full Transportation**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR	25.49	18.13	39.47
SR - Fall (Yrlg)	0.00	2.44	28.04
UCR	5.45	2.69	6.20
LCR - Spring	32.37	30.83	23.57
UWR	36.69	45.91	2.72
Fall			
Chinook salmon			
SR	3.83	4.09	67.63
LCR - Tule fall	71.33	95.91	32.37
LCR - Late run fall	24.84	0.00	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 8b. Estimated juvenile salmon collection at each of the mainstem collection facilities in 2014 under a transportation with spill scenario. Percentage of listed fish at each facility.

****Use this table only if the reartype and/or clip/no-clip status of all handled fish is known****

	Transportation with Spill Scenario									
	Yearling Chinook salmon				Coho salmon			Subyearling Chinook salmon		
	Unclipped		Clipped		Unclipped		Clipped	Unclipped		Clipped
Total fish collected at:*										
Lower Granite	914,118		2,712,376		158,527		0	571,446		405,770
Little Goose	634,232		1,871,080		90,528		0	409,766		290,965
Lower Monumental	342,580		720,164		27,583		0	116,974		113,260
Ice Harbor**	330,088		689,797		21,874		0	104,827		101,498
Columbia River										
Wells***	401,612		1,696,464		221,267		0	NA		NA
Rocky Reach***	429,023		2,321,179		199,140		0	NA		NA
Rock Island***	702,095		3,768,361		1,207,351		0	NA		NA
Wanapum***	631,886		3,391,525		1,086,616		0	NA		NA
Priest Rapids***	568,697		3,052,373		977,955		0	NA		NA
McNary****	751,911		1,825,161		378,735		95,484	7,238,302		2,242,054
John Day** ****	390,684		834,527		169,320		161,209	2,421,664		813,707
The Dalles** ****	1,044,503		2,557,558		441,704		420,545	4,283,604		1,439,340
Bonneville (I & II combined)** *****	442,217		1,599,191		306,314		821,979	273,773		390,481
---To the tailrace of Bonneville	2,352,218		8,506,335		1,629,330		4,372,229	16,104,294		22,969,471
---To Tongue Point*****	7,076,633		26,989,777		3,183,878		14,766,241	38,275,596		51,332,554
	Spring/Summer Chinook	Fall Chinook	Spring/Summer Chinook	Fall Chinook	Coho salmon		Coho salmon	Fall Chinook		Fall Chinook
		Hatchery	Hatchery	Hatchery			Hatchery			Hatchery
Total listed fish at:	Wild	No Ad-clip	No Ad-clip	Ad-clip	Ad-clip	Wild No Ad-clip	Hatchery No Ad-clip	Ad-clip	Wild No Ad-clip	Hatchery No Ad-clip	Ad-clip
Lower Granite	414,377	128,911	71,753	708,291	58,306	0	0	0	125,099	446,347	405,770
Little Goose	291,775	88,339	49,170	491,041	39,955	0	0	0	89,705	320,062	290,965
Lower Monumental	117,874	81,544	68,228	182,789	43,928	0	0	0	29,568	87,406	113,260
Ice Harbor**	116,248	77,601	64,929	176,219	41,804	0	0	0	26,497	78,329	101,498
Columbia River											
Wells***	201,638	199,974	0	443,520	0	0	0	0	NA	NA	NA
Rocky Reach***	244,847	184,176	0	408,482	0	0	0	0	NA	NA	NA
Rock Island***	530,075	172,020	0	603,822	0	0	0	0	NA	NA	NA
Wanapum***	479,718	155,678	0	546,459	0	0	0	0	NA	NA	NA
Priest Rapids***	434,145	140,889	0	494,545	0	0	0	0	NA	NA	NA
McNary****	241,487	119,922	67,663	320,726	43,565	0	0	0	15,702	46,417	60,147
John Day** ****	97,379	48,358	27,285	129,332	17,568	0	0	0	5,253	15,529	20,123
The Dalles** ****	254,032	133,951	71,178	337,388	45,830	0	0	0	9,292	27,469	35,595
Bonneville (I & II combined)** *****	107,848	56,661	30,108	142,715	19,386	17,953	0	0	9,086	8,278	177,745
---To the tailrace of Bonneville	573,660	301,388	160,149	759,122	103,117	95,495	0	0	534,471	486,941	10,455,588
---To Tongue Point*****	4,987,695	991,807	349,300	11,382,452	245,306	1,162,883	380,945	8,137,485	11,129,007	1,686,523	35,475,654
Percent listed fish at:											
Lower Granite	45.33%	14.10%	7.85%	26.11%	2.15%	0.00%	0.00%	0.00%	21.89%	78.11%	100.00%
Little Goose	46.00%	13.93%	7.75%	26.24%	2.14%	0.00%	0.00%	0.00%	21.89%	78.11%	100.00%
Lower Monumental	34.41%	23.80%	19.92%	25.38%	6.10%	0.00%	0.00%	0.00%	25.28%	74.72%	100.00%
Ice Harbor**	35.22%	23.51%	19.67%	25.55%	6.06%	0.00%	0.00%	0.00%	25.28%	74.72%	100.00%
Columbia River											
Wells***	50.21%	49.79%	0.00%	26.14%	0.00%	NA	NA	NA	NA	NA	NA
Rocky Reach***	57.07%	42.93%	0.00%	17.60%	0.00%	NA	NA	NA	NA	NA	NA
Rock Island***	75.50%	24.50%	0.00%	16.02%	0.00%	NA	NA	NA	NA	NA	NA
Wanapum***	75.92%	24.64%	0.00%	16.11%	0.00%	NA	NA	NA	NA	NA	NA
Priest Rapids***	76.34%	24.77%	0.00%	16.20%	0.00%	NA	NA	NA	NA	NA	NA
McNary****	32.12%	15.95%	9.00%	17.57%	2.39%	0.00%	0.00%	0.00%	0.22%	0.64%	2.68%
John Day** ****	24.93%	12.38%	6.98%	15.50%	2.11%	0.00%	0.00%	0.00%	0.22%	0.64%	2.47%
The Dalles** ****	24.32%	12.82%	6.81%	13.19%	1.79%	0.00%	0.00%	0.00%	0.22%	0.64%	2.47%
Bonneville (I & II combined)** *****	24.39%	12.81%	6.81%	8.92%	1.21%	5.86%	0.00%	0.00%	3.32%	3.02%	45.52%
---To the tailrace of Bonneville	24.39%	12.81%	6.81%	8.92%	1.21%	5.86%	0.00%	0.00%	3.32%	3.02%	45.52%
---To Tongue Point*****	70.48%	14.02%	4.94%	42.17%	0.91%	36.52%	11.96%	55.11%	29.08%	4.41%	69.11%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.

** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.

*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.

**** Note: (See next page)

***** Note: (See next page)

**** Note: The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at McNary, John Day, and The Dalles Dams are:
For example, If you handle 1,000 yearling Chinook salmon at Tongue Point, under the Transportation with spill scenario (above),
70.48% of them will be listed wild fish, or 705 fish. To these 705 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 705 x 0.2194 = 155; UCR, 705 x 0.0571 = 40; etc).

Spring/Summer	**Transportation with spill**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR	50.16	50.41	43.11
SR - Fall (Yrlg)	0.00	11.96	36.07
UCR	49.84	37.63	20.82
LCR - Spring	0.00	0.00	0.00
UWR	0.00	0.00	0.00
Fall			
Chinook salmon			
SR	100.00	100.00	100.00
LCR - Tule fall	0.00	0.00	0.00
LCR - Late run fall	0.00	0.00	0.00

***** Note:
Because the Columbia River is a free flowing river below Bonneville Dam and there are no survival estimates available, survival was set at 100% to Tongue Point.
The percentage of listed wild and hatchery spring/summer and fall Chinook salmon at and downstream of Bonneville Dam are:

Bonneville Dam			
Spring/Summer	**Transportation with spill**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR	49.98	50.41	43.11
SR - Fall (Yrlg)	0.00	11.96	36.07
UCR	49.65	37.63	20.82
LCR - Spring	0.37	0.00	0.00
UWR	0.00	0.00	0.00
Fall			
Chinook salmon			
SR	5.22	1.02	16.92
LCR - Tule fall	94.78	98.98	83.08
LCR - Late run fall	0.00	0.00	0.00

Tongue Point			
Spring/Summer	**Transportation with spill**		
Chinook salmon		**Hatchery**	
	Wild	**Ad-clip**	**No Ad-clip**
SR	21.94	15.53	37.04
SR - Fall (Yrlg)	0.00	2.11	26.39
UCR	5.71	2.79	6.98
LCR - Spring	33.91	31.97	26.53
UWR	38.44	47.60	3.06
Fall			
Chinook salmon			
SR	2.59	2.75	58.26
LCR - Tule fall	72.25	97.25	41.74
LCR - Late run fall	25.16	0.00	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
LCR - Spring = Lower Columbia River ESU - Spring Chinook
UWR = Upper Willamette River ESU

LCR - Tule fall = Lower Columbia River ESU - Tule fall Chinook salmon
LCR - Late run fall = Lower Columbia River ESU - Late-run bright fall Chinook salmon

Table 9. Estimated juvenile steelhead trout collection at each of the mainstem collection facilities in 2014 under full transportation and transportation with spill scenarios.

	Full Transportation Scenario			Transportation with SpillScenario		
	Steelhead trout			Steelhead trout		
Total fish collected at:*						
Snake River						
Lower Granite	6,447,137			2,659,444		
Little Goose	1,354,851			1,861,358		
Lower Monumental	306,306			780,601		
Ice Harbor**	172,823			652,957		
Columbia River						
Wells***	624,816			624,816		
Rocky Reach***	618,647			618,647		
Rock Island***	831,065			831,065		
Wanapum***	747,959			747,959		
Priest Rapids***	673,163			673,163		
McNary****	1,443,625			575,894		
John Day** ****	1,220,558			819,989		
The Dalles** ****	923,043			1,591,135		
Bonneville (I & II combined)** *****	1,042,787			588,723		
---To the tailrace of Bonneville	1,895,976			3,098,542		
---To Tongue Point****	14,303,408			12,787,015		
	Steelhead trout			Steelhead trout		
Total listed fish at:		Hatchery			Hatchery	
Snake River	Wild	Ad-clip	No Ad-clip	Wild	Ad-clip	No Ad-clip
Lower Granite	737,629	1,880,533	256,850	304,272	775,720	105,951
Little Goose	160,339	404,992	52,012	213,185	542,844	73,569
Lower Monumental	39,382	74,297	35,881	89,114	220,662	40,930
Ice Harbor**	25,728	52,043	13,041	75,132	185,494	33,620
Columbia River						
Wells***	75,615	499,184	50,017	75,615	499,184	50,017
Rocky Reach***	92,512	478,218	47,917	92,512	478,218	47,917
Rock Island***	108,650	575,199	147,216	108,650	575,199	147,216
Wanapum***	96,807	512,502	131,169	96,807	512,502	131,169
Priest Rapids***	86,255	456,639	116,872	86,255	456,639	116,872
McNary****	201,425	426,084	197,069	71,667	165,374	52,776
John Day** ****	235,938	413,339	137,948	127,010	255,342	68,162
The Dalles** ****	193,735	352,797	93,939	267,078	539,457	126,018
Bonneville (I & II combined)** *****	243,772	349,269	93,000	109,295	184,494	43,098
---To the tailrace of Bonneville	443,222	635,035	169,091	575,237	971,021	226,832
---To Tongue Point****	1,632,214	4,443,860	516,032	1,455,153	3,996,926	449,480
Percent listed fish at:						
Snake River						
Lower Granite	11.44%	29.17%	3.98%	11.44%	29.17%	3.98%
Little Goose	11.83%	29.89%	3.84%	11.45%	29.16%	3.95%
Lower Monumental	12.86%	24.26%	11.71%	11.42%	28.27%	5.24%
Ice Harbor**	14.89%	30.11%	7.55%	11.51%	28.41%	5.15%
Columbia River						
Wells***	12.10%	79.89%	8.01%	12.10%	79.89%	8.01%
Rocky Reach***	14.95%	77.30%	7.75%	14.95%	77.30%	7.75%
Rock Island***	13.07%	69.21%	17.71%	13.07%	69.21%	17.71%
Wanapum***	12.94%	68.52%	17.54%	12.94%	68.52%	17.54%
Priest Rapids***	12.81%	67.84%	17.36%	12.81%	67.84%	17.36%
McNary****	13.95%	29.52%	13.65%	12.44%	28.72%	9.16%
John Day** ****	19.33%	33.87%	11.30%	15.49%	31.14%	8.31%
The Dalles** ****	20.99%	38.22%	10.18%	16.79%	33.90%	7.92%
Bonneville (I & II combined)** *****	23.38%	33.49%	8.92%	18.57%	31.34%	7.32%
---To the tailrace of Bonneville	23.38%	33.49%	8.92%	18.57%	31.34%	7.32%
---To Tongue Point****	11.41%	31.07%	3.61%	11.38%	31.26%	3.52%

* Note: "Total fish collected at:" is the total number of fish collected of that species or run, regardless of rearing type.

** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.

*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established at this time. Also, there is no transportation from these dams.

**** Note: (See next page)

**** Note: The percentage of listed wild and hatchery fish from each ESU at each Columbia River dam from McNary Dam to Bonneville Dam and at Tongue Point.

For example , If you handle 1,000 steelhead at Tongue Point, under the Full Transportation with spill scenario (above), 11.41% of them will be listed wild fish, or 114 fish. To these 114 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 114 x 0.5333 = 61; UCR, 114 x 0.0320 = 4; etc).

	Full Transportation			Transportation with spill		
		Hatchery			Hatchery	
McNary Dam	**Wild**	**AD-clipped**	**No AD-clip**	**Wild**	**AD-clipped**	**No AD-clip**
SR	13.79	13.19	7.15	52.35	56.01	31.81
UCR	34.69	86.81	70.02	19.17	43.99	51.42
MCR - Summer	51.52	0.00	22.83	28.48	0.00	16.77
MCR - Winter	---	---	---	---	---	---
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
John Day Dam						
SR	8.59	9.52	7.15	39.22	46.85	31.81
UCR	21.60	62.64	70.02	14.36	36.79	51.42
MCR - Summer	69.81	27.84	22.83	46.42	16.36	16.77
MCR - Winter	---	0.00	0.00	---	0.00	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
The Dalles Dam						
SR	6.82	7.17	6.75	33.43	39.29	30.48
UCR	17.14	47.18	66.10	12.25	30.85	49.28
MCR - Summer	76.04	45.65	27.15	54.32	29.86	20.24
MCR - Winter	---	0.00	0.00	---	0.00	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Bonneville Dam						
SR	5.30	6.65	6.75	27.76	37.37	30.48
UCR	13.33	43.73	66.10	10.16	29.34	49.28
MCR - Summer	59.12	42.32	27.15	45.10	28.39	20.24
MCR - Winter	14.21	0.00	0.00	10.84	0.00	0.00
LCR - Summer	4.58	0.00	0.00	3.50	0.00	0.00
LCR - Winter	3.46	7.30	0.00	2.64	4.90	0.00
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Tongue Point						
SR	53.33	51.11	69.68	48.96	48.36	65.18
UCR	3.20	6.34	21.04	3.50	7.24	24.34
MCR - Summer	14.21	6.14	8.64	15.54	7.01	10.00
MCR - Winter	3.42	0.00	0.00	3.74	0.00	0.00
LCR - Summer	2.53	5.63	0.23	2.77	2.22	0.00
LCR - Winter	15.17	27.10	0.18	16.58	30.96	0.21
UWR - Summer	---	3.68	0.23	---	4.21	0.27
UWR - Winter	8.14	0.00	0.00	8.91	0.00	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
MCR - Summer = Mid Columbia River ESU summer steelhead
MCR - Winter = Mid Columbia River ESU winter steelhead
LCR - Summer = Lower Columbia River ESU summer steelhead
LCR - Winter = Lower Columbia River ESU winter steelhead
UWR - Summer = Upper Willamette River ESU summer steelhead
UWR - Winter = Upper Willamette River ESU winter steelhead

Table 10. Estimated juvenile steelhead trout collection at each of the mainstem collection facilities in 2014 under full transportation and transportation with spill scenarios. Percentage of listed fish by rearing type (wild or hatchery) at each facility.

****Use this table only if the reartype and/or clip/no-clip status of all handled fish is known****

	Full Transportation Scenario Steelhead trout			Transportation with Spill Scenario Steelhead trout		
	Unclipped		Clipped	Unclipped		Clipped
Total fish collected at:*						
Snake River						
Lower Granite	1,390,202		5,056,935	573,458		2,085,986
Little Goose	292,485		1,048,213	400,098		1,452,645
Lower Monumental	80,471		192,481	173,151		597,111
Ice Harbor**	40,662		94,998	144,159		494,707
Columbia River						
Wells***	125,632		499,184	125,632		499,184
Rocky Reach***	140,429		478,218	140,429		478,218
Rock Island***	255,866		575,199	255,866		575,199
Wanapum***	230,279		517,679	230,279		517,679
Priest Rapids***	207,251		465,911	207,251		465,911
McNary****	458,886		957,923	153,599		415,257
John Day** ****	416,161		785,626	232,827		578,073
The Dalles** ****	318,851		592,125	463,808		1,111,225
Bonneville (I & II combined)** *****	367,637		663,204	176,577		406,639
---To the tailrace of Bonneville	668,431		1,205,825	929,353		2,140,205
---To Tongue Point******	2,893,409		11,532,177	2,559,583		10,342,346
Total listed fish at:						
Snake River	Wild	Hatchery No Ad-clip	Hatchery Ad-clip	Wild	Hatchery No Ad-clip	Hatchery Ad-clip
Lower Granite	737,629	256,850	1,880,533	304,272	105,951	775,720
Little Goose	160,339	52,012	404,992	213,185	73,569	542,844
Lower Monumental	39,382	35,881	74,297	89,114	40,930	220,662
Ice Harbor**	25,728	13,041	52,043	75,132	33,620	185,494
Columbia River						
Wells***	75,615	50,017	499,184	75,615	50,017	499,184
Rocky Reach***	92,512	47,917	478,218	92,512	47,917	478,218
Rock Island***	108,650	147,216	575,199	108,650	147,216	575,199
Wanapum***	96,807	131,169	512,502	96,807	131,169	512,502
Priest Rapids***	86,255	116,872	456,639	86,255	116,872	456,639
McNary****	201,425	197,069	426,084	71,667	52,776	165,374
John Day** ****	235,938	137,948	413,339	127,010	68,162	255,342
The Dalles** ****	193,735	93,939	352,797	267,078	126,018	539,457
Bonneville (I & II combined)** *****	243,772	93,000	349,269	109,295	43,098	184,494
---To the tailrace of Bonneville	443,222	169,091	635,035	575,237	226,832	971,021
---To Tongue Point******	1,632,214	516,032	4,443,860	1,455,153	449,480	3,996,926
Percent listed fish at:						
Snake River						
Lower Granite	53.06%	18.48%	37.19%	53.06%	18.48%	37.19%
Little Goose	54.82%	17.78%	38.64%	53.28%	18.39%	37.37%
Lower Monumental	48.94%	44.59%	38.60%	51.47%	23.64%	36.95%
Ice Harbor**	63.27%	32.07%	54.78%	52.12%	23.32%	37.50%
Columbia River						
Wells***	60.19%	39.81%	100.00%	60.19%	39.81%	100.00%
Rocky Reach***	65.88%	34.12%	100.00%	65.88%	34.12%	100.00%
Rock Island***	42.46%	57.54%	100.00%	42.46%	57.54%	100.00%
Wanapum***	42.04%	56.96%	99.00%	42.04%	56.96%	99.00%
Priest Rapids***	41.62%	56.39%	98.01%	41.62%	56.39%	98.01%
McNary****	43.89%	42.95%	44.48%	46.66%	34.36%	39.82%
John Day** ****	56.69%	33.15%	52.61%	54.55%	29.28%	44.17%
The Dalles** ****	60.76%	29.46%	59.58%	57.58%	27.17%	48.55%
Bonneville (I & II combined)** *****	66.31%	25.30%	52.66%	61.90%	24.41%	45.37%
---To the tailrace of Bonneville	66.31%	25.30%	52.66%	61.90%	24.41%	45.37%
---To Tongue Point****	56.41%	17.84%	38.53%	56.85%	17.56%	38.65%

* Note: "Total fish collected at:" is the total number of fish collected of that species, run and rearing type.

** Note: These dams have no transportation facilities, therefore, no fish are removed from the river at these dams.

*** Note: The numbers shown for these dams represent the number of fish arriving at the dam, not the number collected; FGE's at these dams are not currently established. Also, there is no transportation from these dams.

**** Note: (See next page)

**** Note: The percentage of listed wild and hatchery fish from each ESU at each Columbia River dam from McNary Dam to Bonneville Dam and at Tongue Point.

For example , If you handle 1,000 steelhead at Tongue Point, under the Full Transportation with spill scenario (above), 56.41% of them will be listed wild fish, or 564 fish. To these 564 fish, apply the percentages listed below under the Tongue Point section to determine how many are from each ESU (SR, 564 x 0..5333 = 301; UCR, 564 x 0.0320 = 18; etc).

	Full Transportation			Transportation with spill		
		Hatchery			Hatchery	
McNary Dam	**Wild**	**AD-clipped**	**No AD-clip**	**Wild**	**AD-clipped**	**No AD-clip**
SR	13.79	13.19	7.15	52.35	56.01	31.81
UCR	34.69	86.81	70.02	19.17	43.99	51.42
MCR - Summer	51.52	0.00	22.83	28.48	0.00	16.77
MCR - Winter	---	---	---	---	---	---
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
John Day Dam						
SR	8.59	9.52	7.15	39.22	46.85	31.81
UCR	21.60	62.64	70.02	14.36	36.79	51.42
MCR - Summer	69.81	27.84	22.83	46.42	16.36	16.77
MCR - Winter	---	0.00	0.00	---	0.00	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
The Dalles Dam						
SR	6.82	7.17	6.75	33.43	39.29	30.48
UCR	17.14	47.18	66.10	12.25	30.85	49.28
MCR - Summer	76.04	45.65	27.15	54.32	29.86	20.24
MCR - Winter	---	0.00	0.00	---	0.00	0.00
LCR - Summer	---	---	---	---	---	---
LCR - Winter	---	---	---	---	---	---
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Bonneville Dam						
SR	5.30	6.65	6.75	27.76	37.37	30.48
UCR	13.33	43.73	66.10	10.16	29.34	49.28
MCR - Summer	59.12	42.32	27.15	45.10	28.39	20.24
MCR - Winter	14.21	0.00	0.00	10.84	0.00	0.00
LCR - Summer	4.58	0.00	0.00	3.50	0.00	0.00
LCR - Winter	3.46	7.30	0.00	2.64	4.90	0.00
UWR - Summer	---	---	---	---	---	---
UWR - Winter	---	---	---	---	---	---
Tongue Point						
SR	53.33	51.11	69.68	48.96	48.36	65.18
UCR	3.20	6.34	21.04	3.50	7.24	24.34
MCR - Summer	14.21	6.14	8.64	15.54	7.01	10.00
MCR - Winter	3.42	0.00	0.00	3.74	0.00	0.00
LCR - Summer	2.53	5.63	0.23	2.77	2.22	0.00
LCR - Winter	15.17	27.10	0.18	16.58	30.96	0.21
UWR - Summer	---	3.68	0.23	---	4.21	0.27
UWR - Winter	8.14	0.00	0.00	8.91	0.00	0.00

SR = Snake River ESU
UCR = Upper Columbia River ESU
MCR - Summer = Mid Columbia River ESU summer steelhead
MCR - Winter = Mid Columbia River ESU winter steelhead
LCR - Summer = Lower Columbia River ESU summer steelhead
LCR - Winter = Lower Columbia River ESU winter steelhead
UWR - Summer = Upper Willamette River ESU summer steelhead
UWR - Winter = Upper Willamette River ESU winter steelhead

Table 11. Estimated number of listed fish outmigrating from each ESU, 2014.

		Number of listed fish		
			Hatchery[e]	
ESU	Run	Wild	AD-clipped	Non-AD-clipped
Snake River				
Chinook	Spring/summer	1,367,581	4,469,709	1,065,152
	Fall			
	- subyearlings	502,404	2,300,000	2,310,000
	- yearlings		365,540	520,330
Steelhead	Summer	943,179	3,074,875	456,625
Sockeye		21,929	138,343	0
Upper Columbia				
Chinook	Spring	562,164	782,300	252,492
Steelhead	Summer	115,409	630,020	163,980
Mid-Columbia				
Steelhead	Summer	335,051	338,559	60,517
	Winter	60,353	0	0
Lower Columbia				
Chinook	Spring	1,691,340	3,717,135	351,132
	Fall (tule)	8,041,310	34,498,707	703,907
	Fall (late run)	2,799,724	0	0
Steelhead	Summer	44,754	91,800	0
	Winter	267,933	1,280,244	971
Coho		619,576	8,137,485	380,945
Upper Willamette				
Chinook	Spring	1,275,681	5,535,072	40,493
Steelhead	Summer		174,037	1,227
	Winter	143,898	0	0
Columbia River				
Chum		4,608,900	0	525,863

e Listed hatchery numbers are release numbers.

Appendix A.

Determination of the effects of returning all PIT-tagged spring/summer Chinook salmon to the river at each collection dam on the number of fish that arrive at each subsequent dam

We surveyed researchers regarding the number of outmigrating PIT-tagged spring/summer Chinook salmon in the Snake River we could expect in 2014. We found that 290,400 hatchery fish will be PIT tagged and released above Lower Granite Dam as part of the Comparative Survival Study (CSS). We applied the hatchery survival estimates found in Table 1 to the fish released from hatcheries to determine the number of CSS hatchery fish that will arrive at Lower Granite Dam (191,946). The CSS requires that 70% of the fish collected at each of the Snake River collector dams be transported.

Another 79,511 hatchery spring/summer Chinook salmon (PIT tagged at hatcheries (not part of the CSS) and traps) will arrive at Lower Granite Dam. Of the 271,457 (191,946 + 79,511) hatchery fish reaching Lower Granite Dam, 90,259 will be listed hatchery fish. It is unknown whether the PIT-tagged hatchery fish will be ad-clipped or not, so, because ad-clipped hatchery fish constitute the vast majority of hatchery fish, all PIT-tagged fish are assumed to be ad-clipped for the following calculations.

Because tagging for the 2014 outmigration year began in July 2013 and continues throughout the outmigration year, we cannot accurately estimate survival from tagging of natural and migrating fish to the head of the Lower Granite Reservoir. We assumed that all of these fish would survive to the head of the reservoir, realizing that this is an overestimation. We chose the head of the reservoir because that is where the last of the tagging occurs, and because we have survival estimates from the head of the reservoir to the tailrace of Lower Granite Dam. It is expected that 96,207 wild spring/summer Chinook salmon will be PIT tagged above Lower Granite Dam. Using 90% survival from tagging location through the Lower Granite Dam pool, 86,586 (96,207 x 0.90) will arrive at Lower Granite Dam.

National Marine Fisheries Service will be PIT-tagging fish at Lower Granite Dam during the 2014 outmigration. As part of this marking, 17,935 PIT-tagged wild and no PIT-tagged hatchery spring/summer Chinook salmon will be released into the Lower Granite Dam tailrace. As these fish move downstream, all of those collected at Little Goose and Lower Monumental Dams will be diverted back to the river.

We performed two calculations to determine the expected number of PIT-tagged fish collected at each collector dam. The first calculation made use of the same formulas used under the "Transportation with Spill" and "Full Transportation" scenarios

which assume that every fish collected is transported (except the CSS fish). This calculation provided the number of fish collected at each dam if no PIT-tagged fish were returned to the river. In other words, this calculation is based solely on the number of fish that are not collected and transported at upstream dam(s).

In the second calculation we assumed that the only fish transported at each Snake River collector dam are the CSS fish. This calculation provided the number of fish collected at each dam if the remaining PIT-tagged fish were returned to the river. This calculation includes both the fish that were returned to the river at upstream dam(s) and the fish that were not collected at upstream dam(s). Because the number derived from the second calculation includes the number from the first calculation, the difference between the numbers from these two calculations is the number of PIT-tagged fish that were collected at each dam that were not accounted for because they were returned to the river at each dam (the number for each dam was added to the appropriate "... fish collected ..." columns in Tables 7-8). This difference in the number of fish collected was then expanded to the number of fish that arrived at the dam by dividing by the FGE of that dam, and was added to the number of fish that arrived at McNary Dam because they had not been collected and transported at upstream dams under both the "Transportation with Spill" and "Full Transportation" scenarios (column "Listed fish to McNary" in Tables 2 and 3, respectively).

Calculation 1 (Transportation)

Transportation with Spill Scenario--The numbers presented below assume that 69.7% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 30.3%), and that 30% of the CSS fish are returned to the river. In addition, 17,935 wild and no hatchery fish will be released into the tailrace of Lower Granite Dam from marking at the dam.

Using the FGEs in Table 2, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2014 will be

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	23,321	18,741	37,623	79,685
Lower Monumental	8,527	6,852	13,756	29,135
McNary	8,457	6,796	13,642	28,895

Full Transportation Scenario--The numbers presented below assume that 40.0% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 60.0%), and that 30% of the CSS fish are returned to the river. In addition, 17,935 wild and no hatchery fish will be released into the tailrace of Lower Granite Dam from marking at the dam.

Using the FGEs in Table 3, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2014 will be

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	30,753	21,120	42,400	94,273
Lower Monumental	7,452	5,118	10,274	22,844
McNary	4,829	3,317	6,658	14,804

Calculation 2 (Only CSS fish transported)

This calculation assumes that all collected PIT-tagged fish (except the CSS fish) are returned to the river at each Snake River collector dam.

For the PIT-tagged fish returned to the river at each collection dam, the only loss of fish as they migrate downstream is the mortality through each reservoir and dam. Based on the NMFS survival studies, survival through each reservoir and dam was estimated to be 90%. The estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2014 will be

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	31,137	24,413	44,326	99,876
Lower Monumental	17,017	12,178	19,684	48,879
McNary	21,121	14,441	21,802	57,364

Full Transportation Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Little Goose	61,145	43,179	68,463	172,787
Lower Monumental	42,331	25,707	31,069	99,107
McNary	54,860	31,042	31,393	117,295

Subtracting collection numbers estimated by Calculation 1 from Calculation 2 provides the number of unaccounted for PIT-tagged fish that were collected at each dam (Appendix Table A1).

Appendix Table A1. Estimates of the number of unaccounted for PIT-tagged spring/summer Chinook salmon that will be collected at each of the collection dams, and estimates of how many of these fish will arrive at McNary Dam, 2014.

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	7,816	5,672	6,703	20,191
Lower Monumental	8,490	5,326	5,928	19,744
McNary	12,664	7,645	8,160	28,469
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.308):				
McNary	41,117	24,821	26,494	92,432

Full Transportation Scenario (No Spill)

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	30,392	22,059	26,063	78,514
Lower Monumental	34,879	20,589	20,795	76,263
McNary	50,031	27,725	24,735	102,491
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.800):				
McNary	62,539	34,656	30,919	128,114

Appendix B.

Determination of the effects of returning all PIT-tagged steelhead to the river at each collection dam on the number of fish that arrive at each subsequent dam

We surveyed researchers regarding the number of outmigrating PIT-tagged steelhead in the Snake River we could expect in 2014. We found that 137,693 (47,693 of which will be listed) hatchery fish will be PIT tagged prior to release above Lower Granite Dam. Based on the survival rates of the various hatcheries releasing fish, we estimate that 108,250 (37,320 of which will be listed) will arrive at Lower Granite Dam. Another 18,720 unlisted hatchery steelhead from the Grande Ronde River will arrive at Lower Granite Dam, bringing the total to 126,970 hatchery fish (which includes 37,320 listed fish) arriving at Lower Granite Dam. In addition, 16,928 wild steelhead PIT tagged at traps will arrive at Lower Granite Dam.

National Marine Fisheries Service will be PIT-tagging steelhead at Lower Granite Dam during the 2014 outmigration. As part of this marking, 35,119 PIT-tagged fish will be released into the Lower Granite Dam tailrace. Of these, approximately 15,186 will be wild fish, 7,676 will be listed hatchery fish, and 12,257 will be unlisted hatchery fish. All of the fish collected at Little Goose and Lower Monumental Dams will be diverted back to the river. WDFW plans to release 24,145 PIT-tagged fish into the Tucannon River. Of these, 20,620 will be listed, and 3,525 will be unlisted hatchery fish.

We performed two calculations to determine the expected number of PIT-tagged fish collected at each collector dam. The first calculation made use of the same formulas used under the "Transportation with Spill" and "Full Transportation" scenarios which assume that every fish collected is transported. This calculation provided the number of fish collected at each dam if no PIT-tagged fish were returned to the river. In other words, this calculation is based solely on the number of fish that are not collected and transported at upstream dam(s).

In the second calculation we assumed that no fish are transported. This calculation provided the number of fish collected at each dam if all PIT-tagged fish were returned to the river. This calculation includes both the fish that were returned to the river at upstream dam(s) and the fish that were not collected at upstream dam(s). Because the number derived from the second calculation includes the number from the first calculation, the difference between the numbers from these two calculations is the number of PIT-tagged fish that were collected at each dam that were not accounted for because they were returned to the river at each dam (the number for each dam was added to the appropriate "... fish collected ..." columns in Tables 9-10). This difference in the number of fish collected

was then expanded to the number of fish that arrived at the dam by dividing by the FGE of that dam, and was added to the number of fish that arrived at McNary Dam because they had not been collected and transported at upstream dams under both the “Transportation with Spill” and “Full Transportation” scenarios (column "Listed fish to McNary" in Tables 5 and 6, respectively).

Calculation 1 (Transportation)

Transportation with Spill Scenario--Assuming that 67.0% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 33.0%), 11,342 (16,928 x 0.670) wild, 25,004 (37,320 x 0.670) listed hatchery, and 51,141 (76,330 x 0.670) unlisted hatchery fish will reach the Lower Granite Dam tailrace. In addition, 15,186 wild, 7,676 listed hatchery, and 12,257 unlisted hatchery fish will be released into the tailrace from marking at the dam. Therefore, the total numbers of PIT-tagged fish in the Lower Granite Dam tailrace will be 26,528 (11,342 + 15,186) wild, 32,680 (25,004 + 7,676) listed hatchery, and 63,398 (51,141 + 12,257) unlisted hatchery fish.

Using the FGEs in Table 5, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2014 will be

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	9,073	11,177	21,682	41,932
Lower Monumental	3,451	9,591	9,159	22,201
McNary	1,416	3,934	6,376	11,726

Full Transportation Scenario--Assuming that 20.0% of the PIT-tagged fish arriving at Lower Granite Dam will not be collected (FGE = 80.0%), 3,386 (16,928 x 0.20) wild, 7,464 (37,320 x 0.20) listed hatchery, and 15,266 (76,330 x 0.20) unlisted hatchery fish will reach the Lower Granite Dam tailrace. In addition, 15,186 wild, 7,676 listed hatchery, and 12,257 unlisted hatchery fish will be released into the tailrace from marking at the dam. Therefore, the total numbers of PIT-tagged fish in the Lower Granite Dam tailrace will be 18,572 (3,386 + 15,186) wild, 15,140 (7,464 + 7,676) listed hatchery, and 27,523 (15,266 + 12,257) unlisted hatchery fish.

Using the FGEs in Table 6, the estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2014 will be

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	15,043	12,263	22,294	49,600
Lower Monumental	978	14,200	3,740	18,918
McNary	383	5,574	14,788	20,745

Calculation 2 (No Transportation)

Assuming that 100% of the collected PIT-tagged fish are returned to the river at Lower Granite Dam, 32,114 (16,928 + 15,186) wild, 44,996 (37,320 + 7,676) listed hatchery, and 88,587 (76,330 + 12,257) unlisted hatchery fish will reach the tailrace.

Because 100% of the PIT-tagged fish were assumed to be returned to the river at each collection dam, the only loss of fish as they migrate downstream is the mortality through each reservoir and dam. Based on the NMFS survival studies, survival through each reservoir and dam was estimated to be 90%. The estimated number of PIT-tagged fish collected at each dam below Lower Granite Dam in 2014 will be

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	10,983	15,389	30,297	56,669
Lower Monumental	6,737	14,781	19,498	41,016
McNary	3,729	8,182	13,413	25,324

Full Transportation Scenario

Dam	Wild	Listed hatchery	Un-listed hatchery	Total
Little Goose	26,012	36,447	71,755	134,214
Lower Monumental	16,908	37,094	48,932	102,934
McNary	18,964	41,603	68,199	128,766

Subtracting collection numbers estimated by Calculation 1 from Calculation 2 provides the number of unaccounted for PIT-tagged fish that were collected at each dam (Appendix Table B1).

Appendix Table B1. Estimates of the number of unaccounted for PIT-tagged steelhead that will be collected at each of the collection dams, and estimates of how many of these fish will arrive at McNary Dam, 2014.

Transportation with Spill Scenario

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	1,910	4,212	8,615	14,737
Lower Monumental	3,286	5,190	10,339	18,815
McNary	2,313	4,248	7,037	13,598
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.177):				
McNary	13,068	24,000	39,757	76,825

Full Transportation Scenario (No Spill)

Dam	Wild	Listed hatchery	Unlisted hatchery	Total
Number of unaccounted for PIT-tagged fish collected:				
Little Goose	10,969	24,184	14,153	49,306
Lower Monumental	15,930	22,894	33,354	72,178
McNary	18,581	36,029	26,815	81,425
Number of unaccounted for PIT-tagged fish that arrived at McNary Dam (FGE = 0.90):				
McNary	20,645	40,032	29,794	90,471